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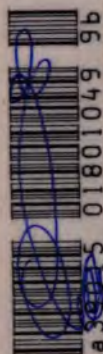
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Ohio State Academy of Science.

SPECIAL PAPERS NO. 2.

THE
ODONATA OF OHIO

A DESCRIPTIVE CATALOGUE OF THE DRAGONFLIES
KNOWN IN OHIO, WITH KEYS FOR
THEIR DETERMINATION.

A POSTHUMOUS PAPER

BY

DAVID S. KELLICOTT, "H. D.,

LATE PROFESSOR OF ZOOLOGY AND ENTOMOLOGY IN THE OHIO
STATE UNIVERSITY.

PUBLISHED BY THE ACADEMY OF SCIENCE,
MARCH, 1899.

PRESS OF CLAPPER PRINTING CO.
WOOSTER, OHIO.

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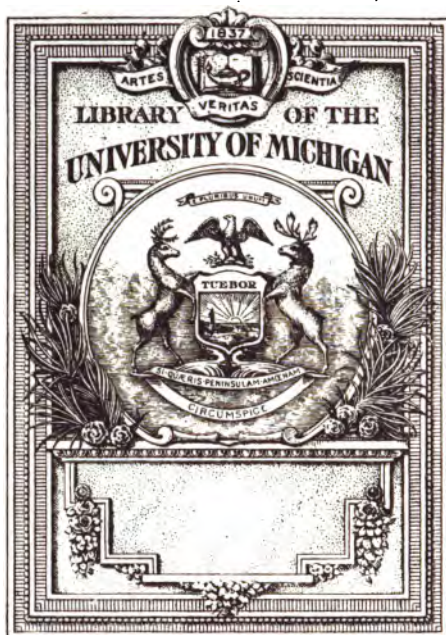
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PREFATORY NOTE

The paper on the *Odonata* of Ohio, by Prof. D. S. Kellicott herewith presented to the public, was in such an advanced stage of progress at the time of his death that there can be no possible question as to the desirability of publishing it in the form which he had given to it. It was necessary, however, in order to give it the completeness that would make it most serviceable in the line intended by the author that the species not covered in the manuscript he left should be given a similar treatment. This duty has been performed by Mr. J. S. Hine, whose long association with Prof. Kellicott, and participation with him in the collection and preparation of material on which the paper is based gave him exceptional advantages for the work. Of the original manuscript by Prof. Kellicott, which covers everything up to and including *Gomphus externus* nothing has been changed, except to make such verbal changes as he himself would have made on a final revision for the press. For the remainder the effort has been to complete as nearly as possible on the plan followed by Prof. Kellicott, in the portion he had finished and, wherever possible, use has been made of his published descriptions.

The sketch of Prof. Kellicott's life, and the bibliography have also been prepared by Mr. Hine, the drawings for the plates by Mr. W. E. Kellicott.

HERBERT OSBORN.

Dept. Zool. and Ent. O. S. U., Columbus, Ohio.

Feb. 10, 1899.

31483

BIOGRAPHICAL SKETCH.

David S. Kellicott, Ph. D., late Professor of Zoology and Entomology at the Ohio State University, was born at Hasting's Center, Oswego County, New York, January 28, 1842. His boyhood days were spent on a farm, where early in life he acquired an intense love for nature.

He availed himself of the opportunities for preliminary education offered by the district school, and prepared for College at Mexico Academy, Mexico, New York. He entered Genesee College, now Syracuse University, and completed the science course. Later he received the degrees of Bachelor of Philosophy, and Doctor of Philosophy from the same Institution. His life work was teaching; he taught village schools at first, but was soon called to college work, and from 1870-'72 was teacher of Mathematics in the Keystone State Normal School. At this time an opportunity presented, and he accepted a position in his chosen field, becoming Professor of Natural History in the Buffalo State Normal School, which position he held until he resigned in 1888, to accept the position at the Ohio State University. Here his quiet enthusiasm, indomitable energy and enlightened judgment developed his department to a high degree of efficiency.

The scientific attainments of Professor Kellicott have been gratefully recognized by an appreciative public. At the time of his death he was president of the American Microscopical Society, General Secretary of the American Association for the Advancement of Science, and Treasurer of the Ohio State Academy of

Science. Formerly he was president of the Buffalo Academy of Science, and the Ohio State Academy of Science. He was among the first in this country to become a fellow of the Royal Microscopical Society of London.

His death was caused by pneumonia. After an illness of only a few days he died April 13th 1898.

Professor Kellicott has contributed articles to various American periodicals, most of which are included in the following list.

PROCEEDINGS OF THE AMERICAN SOCIETY OF MICROSCOPISTS.

- 1879. On Certain Crustaceous Parasites of Fishes from the Great Lakes. I, 53.
Observations on *Lerneocera cruciata*. I, 64.
- 1880. *Lerneocera tortura*, n. s. II, 41.
- 1882. On Certain Crustaceous Parasites of Fresh-Water Fishes. IV, 75.
Polyzoa—Observations on Species Detected near Buffalo, N. Y. IV, 217.
- 1883. On some Infusoria found on the Cray-Fish. V, 105.
Cothurnia lata, n. s. V, 113.
Note on two Parasites of the Cray-Fish. V, 115.
- 1884. Observations on Infusoria with Description of New Species. VI, 110.
Notes: Infusoria, Rotatoria, Etc. VI, 126.
- 1885. Observations on some Fresh-water Infusoria—with Descriptions of a few Species regarded as new. 38.
A new Floscule. 48.
- 1886. A note on *Argulus catostomi*. 144.
- 1887. Additional note on a Certain Species of Rotifera. 181.
Some new and rare Infusoria. 187.
- 1888. President's Address: The Nature of Protozoa, and Lessons of these Simplest Animals. 5.
Partial List of Rotifera of Shiawassee River, at Corunna, Michigan. 84.
Observations of Fresh-water Infusoria. 97.
- 1889. A New Rotiferon. 32.
- 1892. Crustaceous Parasite of the "Miller's Thumb." 76.
- 1895. Formalin in the Zoological and Histological Laboratory. 331.
- 1896. The Rotifera of Sandusky Bay—First Paper. 155.
- 1897. The Rotifera of Sandusky Bay—Second Paper. 43.

ANNUAL REPORT OF THE OHIO STATE ACADEMY OF SCIENCE.

1893. On Certain Marine Infusoria observed at Woods Hall, Mass. II, 10.
Preliminary Report of the Dragonflies of Ohio. II, 11.
1895. Third Report on the Odonata of Ohio. IV, 33.
1896. Additions to the Catalogue of the Odonata of Ohio. V, 47.
Preliminary Report on the Fresh-Water Sponges of Ohio. V, 50.
1897. Additions to the Catalogue of Dragonflies of Ohio. VI, 27.

INSECT LIFE.

1891. The Preparatory Stages of *Eustrotia caduca*. III, 321.
1892. Note on the Horn Fly in Ohio. IV, 35.
1893. *Hypoderas columbæ*—A Note. V, 77.
Notes on the *Aegeriidae* of Central Ohio—II. V, 81.

JOURNAL OF THE CINCINNATI SOCIETY OF NATURAL HISTORY.

1893. Remarkable Malformation in a Cat. XV, 54.
1895. Catalogue of Ohio Odonota—Part I. XVII, 195.
1896. Catalogue of Ohio Odonota—Part II. XVIII, 105.
1897. Catalogue of Ohio Odonota—Part III. XIX, 66.
An Odonate Nymph from a Thermal Spring. XIX, 63.

ENTOMOLOGICA AMERICANA.

1885. On the Larval Stages of *Harmonia pini*, and a Parasite of the same. I, 171.
On the Preparatory Stages of an Undetermined Cossus. I, 173.
1886. Notes on Two Larvæ of the Genus *Catocala*. II, 45.
1888. Note on *Hepialis argenteomaculatus*. IV, 153.

ENTOMOLOGICAL NEWS.

1890. Dragonflies Congregating at Night. I, 146.
1891. *Retinia comstockiana*, Fernald. II, 33.
Platycerura furcilla, Packard. II, 33.
Psyche confederata, G. & R. II, 122.
There are exceptions. II, 208.
1892. *Perophora melsheimerii*. III, 18.
Cossid or Hepialid? III, 123.
1892. The White Ant Again. V, 314.
Distribution of Odonata: V, 314.
1895. Odonata—A Note and a Description. VI, 239.

TRANSACTIONS OF THE OHIO STATE MEDICAL SOCIETY.

Certain Entozoa of the Dog and Sheep. 1894.
The State University and Medical Education.

JOURNAL OF THE COLUMBUS HORTICULTURAL SOCIETY.

1890. Our Injurious *Ægerians*. V, 11.
Blackberry Borer, (*Bembicia marginata*). V, 27.
1891. Entomology. VI, 60.
Report of the Committee on Entomology. VI, 100.
1892. Observations on Forest Insects. VII, 92.
Report of the Committee on Entomology. VII, 96.
Report of the Committee on Entomology, VII, 111.
1894. Some Museum and Granary Pests. IX, 11.
The White Ant. IX, 81.
Report of the Committee on Entomology. IX, 179.
1895. Report of the Committee on Entomology. X, 58.
Report of the Committee on Entomology. X, 144.
1896. Remarkable Extension in the Northward Range of the Bag or
Basket Worm. XI, 4.
Report of the Committee on Entomology. XI, 48.

AMERICAN MONTHLY MICROSCOPICAL JOURNAL.

1885. Opercularia constricta, n. s.
1888. Nature of Protozoa.

NATURALISTS BULLETIN.

1883. The Larvæ of the Catocalæ.

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BULLETIN OF THE BUFFALO NATURALIST'S AND FIELD CLUB.

1883. Notes on Protozoa. No. I.
Notes on Protozoa. No. II.
Entomological Notes. 41.
Entomological Notes. 68.
Entomological Notes. 88.

BULLETIN OF THE BUFFALO SOCIETY OF NATURAL SCIENCE.

1877. Description of a New Species of Argulus. III, 214.
1882. Observations and Notes. IV, 29.
Notes on the Larvæ of some Local Pterophoridaæ. IV, 47.
Observations and Notes. IV, 61.

THE MICROSCOPE.

1887. Notes on Fresh Water Infusoria, with Remarks on Collecting and Preserving these Delicate Animals.
1889. Intestinal Parasitic Infusoria of the Frog.

CANADIAN ENTOMOLOGIST.

1878. A New Gall Moth, and Notes on Larvæ of Other Gall Moths. X, 201.
1879. Observations on *Nephopterix zimmermani*. XI, 114.
1880. Correspondence. XII, 59.
Larval Habits of the Golden-rod Boring Plume. XII, 105.
1881. Observations on Several Species of *Ægeriadae* inhabiting the Vicinity of Buffalo, N. Y. XIII, 3.
The Larvæ of *Catocala unijuncta*. XIII, 38.
Notes on *Ægeria pini*. XIII, 157.
1882. Is *Poedisca Scudderiana* a Gall-maker? XIV, 161.
1883. *Psephenus Lecontei*—On the External Anatomy of the Larva. XV, 191.
1884. A Note—Ovipositing Apparatus of *Nonagria Subcarnea*. XVI, 170.
1884. Occurrence of the Basket-worm in Ontario. XVI, 180.
1885. *Eumacaria brumearia*, Packard. XVII, 32.
1889. *Arzama obliquata*. XXI, 39.
1891. Notes on Two Borers Injurious to the Mountain Ash. XXIII, 250.
1892. Notes on the *Ægeriadae* of Central Ohio. XXIV, 42.
Notes on the *Ægeriadae* of Central Ohio—II. XXIV, 209.
Preparatory Stages of *Calothyssanis amaturaria*, XXIV, 242.
1894. List of the Dragon-flies of Corunna, Michigan. XXVI, 345.
1895. Correction. XXVII, 15.

AGRICULTURAL STUDENT.

1895. The Hessian Fly. II, 31.
1896. Notes on the Occurrence of Dragonflies in Ohio. III, 141.
1897. Rare Ohio Dragonflies. IV, 45.

REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

1891. Note on the Horn Fly in Ohio. XXII, 59.

PROCEEDINGS OF INDIANA ACADEMY OF SCIENCE.

1895. Rotifera. 242.
Odonata. 251.

MISCELLANEOUS.

1897. Dissection of an Ophidian—Published by the Author.
1881. Address of the Retiring President of the Buffalo Microscopical Club.
1899. The Odonata of Ohio. Published as Special Papers 2. Ohio State Academy of Science.





Yours truly,
D. J. Kellicott.

TO MY ASSOCIATES AND STUDENTS
IN THE
DEPARTMENT OF ZOOLOGY
OF THE
OHIO STATE UNIVERSITY, THIS BOOKLET IS DEDICATED,
IN MEMORY OF
HAPPY HOURS SPENT TOGETHER
AS NATURALISTS IN FIELDS AND WOODS.

INTRODUCTION.

This brochure has been prepared in answer to the often repeated query of students and young naturalists, "What book can I get to help me in identifying the dragonflies." If it does not prove helpful to these inquiring ones, the purpose of its making has been missed. The effort has been to prepare a helpful and suggestive guide, clear and scientifically accurate; and to record without too painful dryness, the present state of our knowledge of a delightful group of insects. Should the attempt prove in a measure successful, as a means of increasing interest in these lively creatures and in helping some earnest minded young people to enjoy more thoroughly the pleasures of studying nature afield, the writer will feel richly repaid for his pains.

The writings of Dr. Herman Hagen, Baron de Selys-Longchamps, W. F. Kirby, Benjamin D. Walsh Philip P. Calvert, Nathan Banks, Rene' Martin and other students of the odonata have been freely consulted and deep obligations to each are acknowledged. Much assistance has been given in collecting by Professor J. S. Hine, Professor E. E. Bogue, by my son, W. E. Kellicott and by many students of the Ohio State University.

It does not seem necessary to give here an account of the anatomy and metamorphosis of the dragonflies; this has been done quite recently in papers by Nathan Banks,¹ Philip P. Calvert,² and by Professor J. H. Comstock,³ nor will the bibliography be repeated, as it

(1.) A Synopsis Catalogue and Bibliography of the Neuropteroid Insects of Temperate North America. *Transaction of the Am. Ent. Soc., of Philadelphia*, Vol. XIX.

(2.) Catalogue of the Odonata of the vicinity of Philadelphia, with an Introduction to the Study of this Group of Insects. *Ib.* Vol. XX.

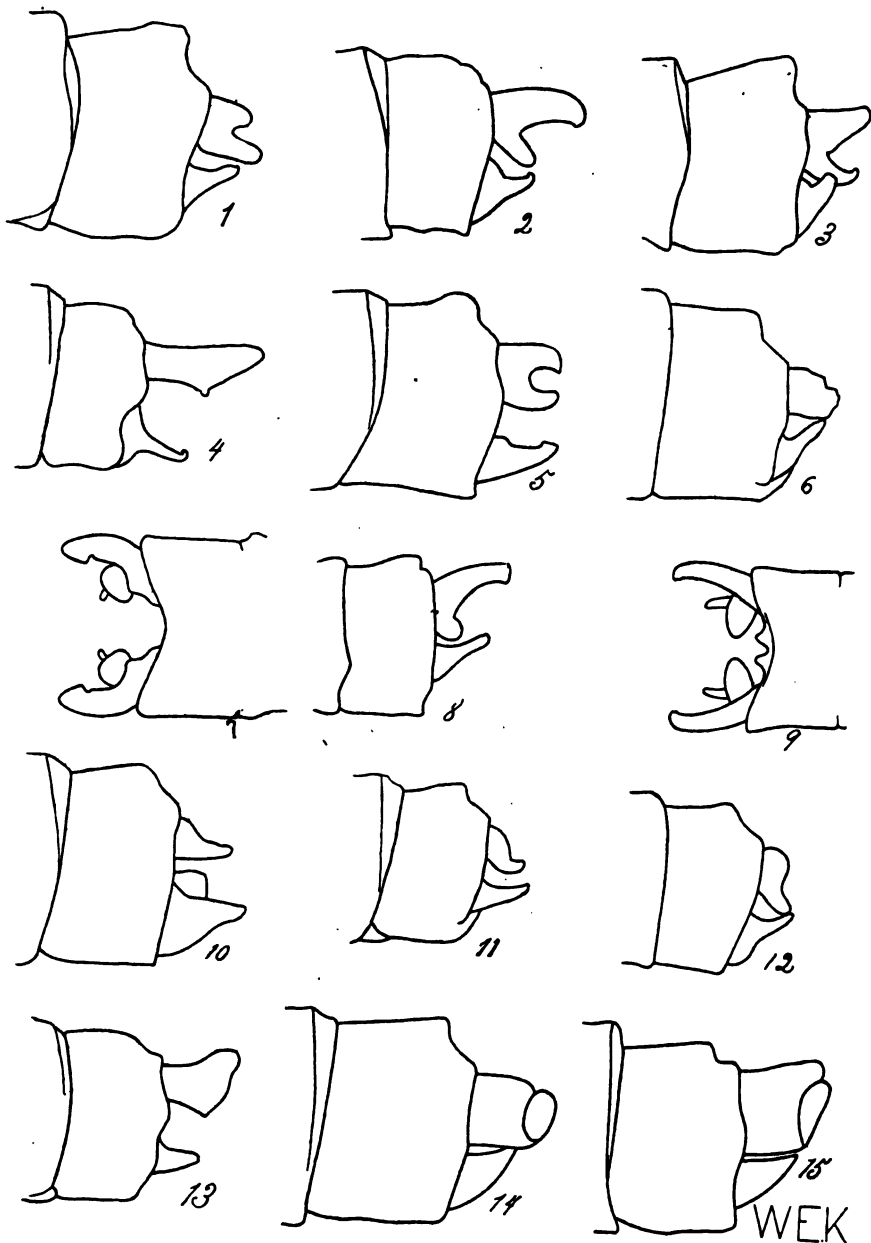
(3.) *Manual for the study of Insects*, Ithaca. N. Y., 1885.

is accessible to most students in the papers cited and in the Synoptic Catalogue of W. F. Kirby. References will be made, by foot notes, to descriptions made since the papers cited were published.

Dragonflies occur in most parts of the earth. Representatives of this ancient race fly beyond the Arctic Circle and at an elevation of 10,000 feet. However, they are heat-loving insects and of course are more numerous in tropical and sub-tropical countries than elsewhere. The number of known species in the whole world exceeds 2000; in North America about 300; and in Ohio 100.

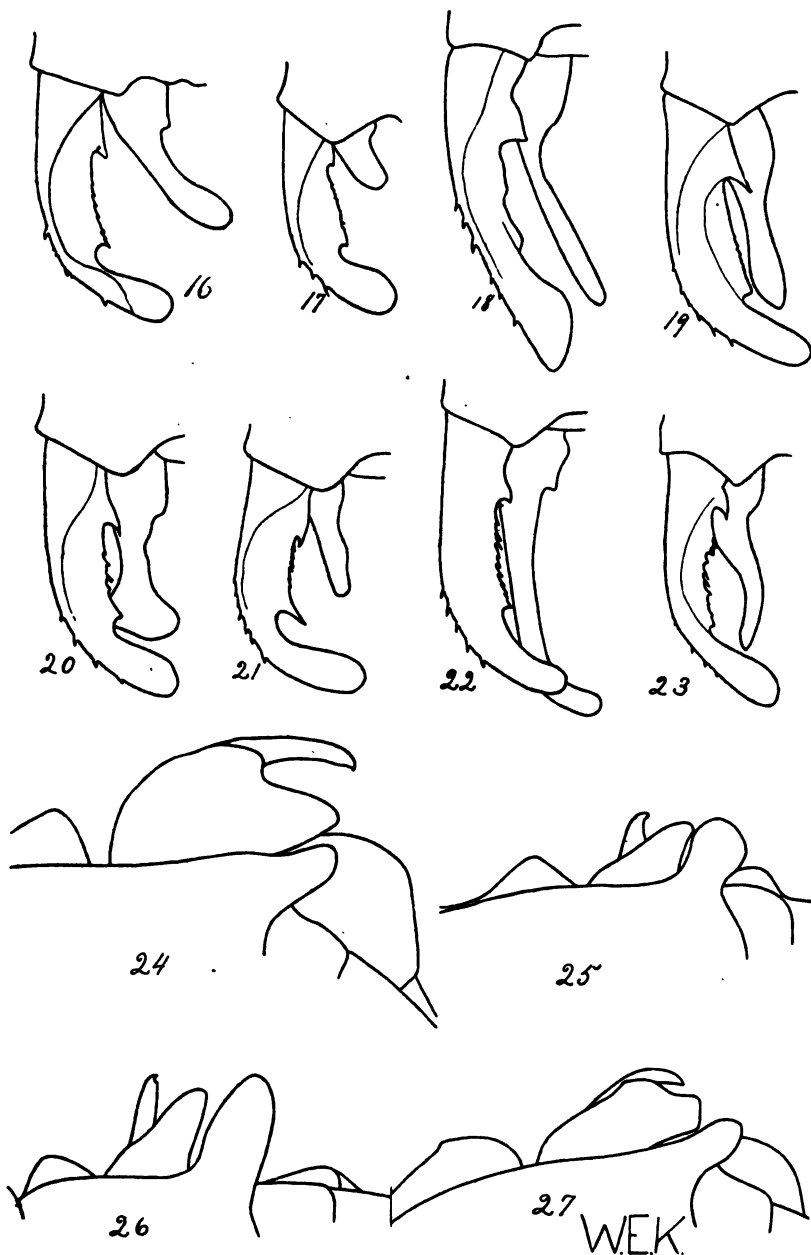
The Odonate fauna of Ohio is essentially rich in species and in the number of individuals. The great lake system on the north, and the Ohio River on the south afford favorable conditions for their life, and avenues for their approach from south-west and north-west; while our diversified area with its numerous rivers and morasses is not an unfavorable habitat. The number of living species listed for Great Britain is forty-five, for France seventy, and for all Europe one hundred and twenty. Still our Century of Odonates, it is supposed, represents a waning race; once, when the climate was more nearly tropical, the number was probably much greater. A question of equal interest is whether the results of the changes incident to civilization have produced a diminution of our resident species. There is an impression abroad that we have lost species in, for example, the present century; that some species cannot withstand the consequences of stream pollution, drainage of morasses, and the more inconstant character of the streams and ponds. There are no data for determining the question. It is the opinion of the writer that some few forms once residents are no longer within our limits, but that others have taken up their homes here at the same time; in fact it appears probable that the number has increased rather than diminished up to the present time.

The pronounced individuality of the Dragonflies has attracted the attention of people to them quite universally and strongly. This is shown by the awakened imagination shown in the many and often strikingly significant popular names. The Germans call them "*Wassernymphe*," the Dutch "*Scherpstekendevlieg*," the French "*Demoiselle*," the Portugese "*Mosca que da grandes picacas*," the Italians "*Saetta*," the English Dragonflies or Horsestingers, while in our own country we may have not only the English names but others quite as forcible; for example, "Spindles," "Mosquito-hawks," "Snake-feeders," "Snake-doctors," "Darning-needles," or to be more profane "Devil's darning-needles." These names most happily express the characteristics of these veritable dragons of the air and water. It has been said that "some of these names testify to the wide spread, but quite unfounded, belief in the harmfulness of these creatures to man." The writer recalls at least one grown person who truly believed they were harmful. This was a school teacher, who impressed upon him, and others of her charge, that the devil's darning-needles about the "old swimmin' hole" were dangerous, and that they were quite determined to sew up the ears of truants who sought the limpid waters and grass-covered banks of the millrace, rather than the hard and strict ways of the prosy school-room. This is the one "fact" of Natural History he remembers to have been taught him in the "district" school.



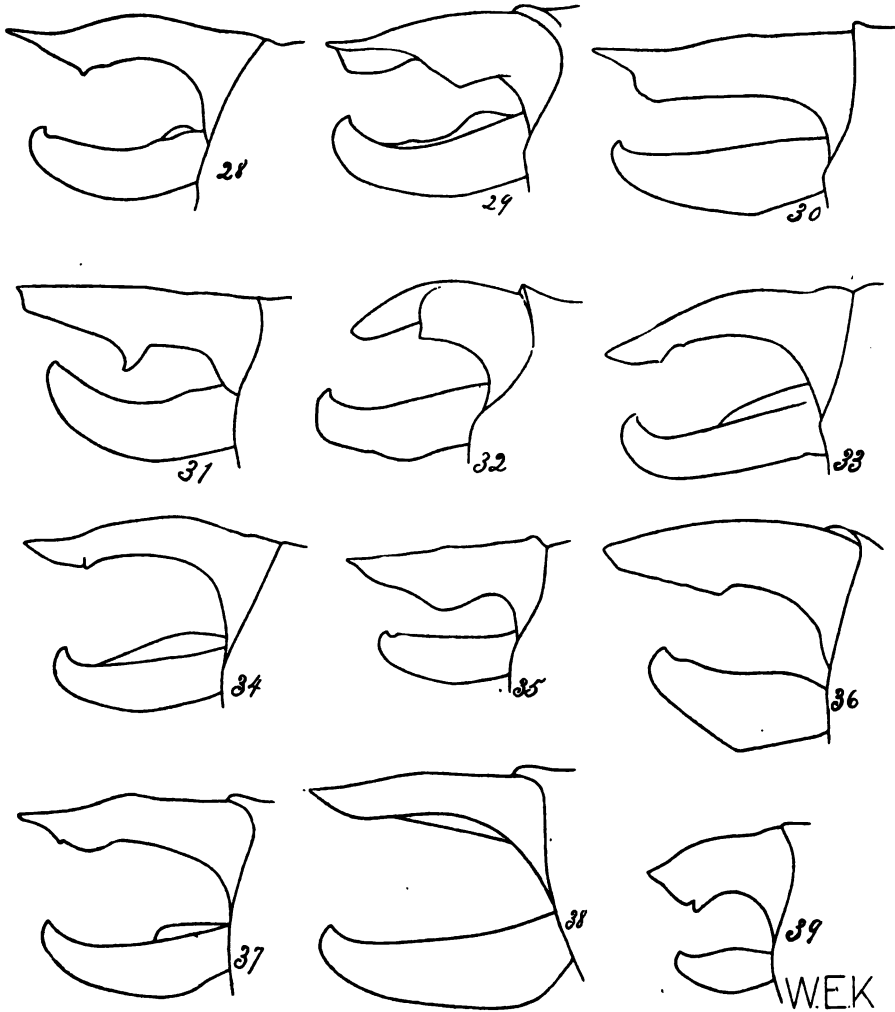
EXPLANATION OF FIGURES.

1. Lateral view of ♂ abdominal appendages of *Enallagma exulans*.
2. Same *E. aspersum*.
3. Same *E. fischeri*.
4. Same *E. signatum*.
5. Same *E. ebrium*.
6. Same *E. doubledayi*.
7. Dorsal view ♂ abdominal appendages *E. aspersum*.
8. Lateral view ♂ abdominal appendages *E. traviatum*.
9. Dorsal view ♂ abdominal appendages *E. traviatum*.
10. Lateral view ♂ abdominal appendages *E. hageni*.
11. Same *E. geminatum*.
12. Same *E. divagans*.
13. Same *E. pollutum*.
14. Same *E. carrunculatum*.
15. Same *E. civile*.



EXPLANATION OF FIGURES.

- | | |
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| 16. Dorsal view left ♂ abdominal appendages <i>Lestes disjuncta</i> . | 24. Lateral view external ♂ genital organs of second abdominal segment of <i>Diplax rubicundula</i> , as seen when the insect is turned upside down. |
| 17. Same <i>L. congener</i> . | 25. Same <i>D. semicincta</i> . |
| 18. Same <i>L. vigilax</i> . | 25. Same <i>D. vicina</i> . |
| 19. Same <i>L. forcipata</i> . | 27. Same <i>D. obtrusa</i> . |
| 20. Same <i>L. uncata</i> . | |
| 21. Same <i>L. rectangularis</i> . | |
| 22. Same <i>L. inæqualis</i> . | |
| 23. Same <i>L. unguiculata</i> . | |



EXPLANATION OF FIGURES.

- | | |
|---|----------------------------------|
| 28. Lateral view ♂ abdominal ap-
pendages <i>Gomphus fraternus</i> . | 34. Same <i>G. vastus</i> . |
| 29. Same <i>G. grashnelli</i> . | 35. Same <i>G. exilis</i> . |
| 30. Same <i>G. villosipes</i> . | 36. Same <i>G. plagiatus</i> . |
| 31. Same <i>G. spicatus</i> . | 37. Same <i>G. lividus</i> . |
| 32. Same <i>G. furcifer</i> . | 38. Same <i>G. spiniceps</i> . |
| 33. Same <i>G. externus</i> . | 39. Same <i>G. quadricolor</i> . |

W.E.K.

The Systematic Place of the Odonata.

The orders of insects fall naturally into two groups: those having incomplete metamorphosis, *Heterometabola*, and those in which the metamorphosis is complete, *Metabola*. In the latter group of orders there are four sharply separated stages,—egg, larva, pupa and imago; in the former the changes incident to the period of adolescence are gradual, so that the larval and pupal stages are not sharply defined. The young continue active and feed from birth until the final change to imago. Such growing insects are called nymphs.

They are arranged by Professor J. H. Comstock, as follows:

Heterometabola.

Thysanura.
Ephemerida.
Odonata.
Plecoptera.
Isoptera.
Corrodentia.
Mallophaga.
Euplexoptera.
Orthoptera.
Physopoda.
Hemiptera.

Metabola.

Neuroptera.
Mecoptera.
Trichoptera.
Lepidoptera.
Diptera.
Siphonaptera.
Coleoptera.
Hymenoptera.

Thus the Odonata or Dragonflies rank among least specialized insects; those most nearly related to the

primitive stock; to those orders having representatives at lower geological horizons than *Metabola*. They present, however, some contrasts and exceptions to those of related orders. In these the head thorax and abdomen are sharply separated as in *Metabola*. They are active, powerful and boldly predaceous. Their nymphs, as well as the adults, exhibit the malignant side of life that lived and sported about the marshes of the remote Tertiary Period.

LESSER GROUPS OF THE ORDER.

The Order *Odonata* is divided into two sub-orders :

I. *Zygoptera* in which both pairs of wings are similar and which in repose are held vertically; the males have two inferior abdominal appendages and the nymphs have three caudal gill-plates; and II. *Anisoptera* in which the two pairs of wings are dissimilar, in repose they are held horizontally; the males have one terminal inferior abdominal appendage, and the nymphs have no terminal gill-plates.

Our representatives of the Order may be arranged in the following lesser groups:

ORDER ODONATA.

I. SUB-ORDER ZYGOPTERA.

1. FAMILY AGRIONIDÆ.

- (1) Sub-family Calopteryginæ.
- (2) Sub-family Agrioninæ.

II. SUB-ORDER ANISOPTERA.

2. FAMILY ÆSCHNIDÆ.

- (3) Sub-family Gomphinæ.
- (4) Sub-family Corduligasterinæ.
- (5) Sub-family Æschninæ.

3. FAMILY LIBELLULIDÆ.

(6) Sub-family Cordulinæ.

(7) Sub-family Libellulinæ.

Key to the Foregoing Sub-families.

1. Wings alike, closed vertically in repose, eyes far separated.....2
Not as above.....3
2. More than two antecubitals.....(1) *Calopteryginæ*.
Only two antecubitals.....(2) *Agrioninæ*.
3. Antecubitals of the first and second series, not corresponding throughout 4.
Corresponding throughout.....5.
4. Eyes separated by a wedge-shaped occiput.....(3) *Gomphinæ*.
Eyes barely touching.....(4) *Corduligasterinæ*.
Eyes touching for a short distance.....(5) *Aeschninæ*.
5. Eyes tuberculated behind.....(6) *Cordulinæ*.
Eyes not tubercled.....(7) *Libellulinæ*.

THE FIRST SUB-FAMILY.

CALOPTERYGINÆ.

The species of this sub-family are among the most beautiful of dragonflies. Their bright metallic colors, their clouded and reticulated wings, their slender and graceful bodies at once attract attention. Their flight is not strong and they seldom wander far from the grassy borders of native pond or stream, where in turn they are to deposit their eggs and where their young are to be matured. While our species are few, most of them are common and occur everywhere; they belong to genera determined as follows:

1. Basilar space free, wings broad.....*Calopteryx*.
2. Basilar space reticulated, wings narrower.....*Hetærina*.

CALOPTERYX, Leach.

Only two species are known within our limits. Two different species—*C. elegans* and *C. dimidiata*,

have been taken in Kentucky and doubtless will yet be found on this side of the great river.

The species of the genus are arranged in two groups, thus:

1. Wings spatulate, *i. e.* anterior and posterior margins of the wings not parallel.
 - (1.) Wings uniformly velvety black, (brownish in young).
maculata.
 - (2.) Wings hyaline basally, apical third or fourth blackish.
æquabalis.
2. Wings not spatulate, *i. e.*, anterior and posterior margins nearly parallel.*

*No representatives as yet recorded from the State.

1. *Calopteryx maculata*, Beauvois.

Length: of hind wing, ♂ 28 mm., ♀ 30; of abdomen ♂ and ♀ 37 mm.

The males are metallic blue or green; the antennæ, under parts of head and thorax, legs, a broad humeral stripe, the thoracic sutures and under parts of the abdominal segments 1-7 are black; segments 8-10 and inferior appendages below are light—sometimes the black extends to 10 or even to the appendages. The wings are velvety black in the adult, some shade of brown in the young.

The superior appendages are forcipate, at base nearly cylindrical, narrowing to the middle at which they suddenly expand interiorly to the somewhat swollen and slightly decurved apex; the distal half bears several stout denticles on its outer margin. The inferior appendages are shorter, truncate, somewhat curved inward and upward, with a sharp incurved tooth at inner angle.

The females have the head and thorax similar to the males, but with more blackish shades and the abdomen brassy brown with a pale light or white dorsal band on 8-10, broader on 9 and often including a part of 7. Abdominal appendages nearly as long as 10, slender, pointed and black. The wings are similar

to those of the young males, often darker apically, especially on the hind wings; the pterostigma (absent in the male) is milk white, broad and reticulated; it varies greatly in size, but is always relatively broad.

This species is found throughout the State, and is abundant in most localities. It prefers small streams, especially the meadow-brooks and the clear, cool rivulets from springs among the hills. It also occurs by the borders of larger living waters where the banks are overhung by foliage. In this form, the male does not always seize the female with his feet previous to clasping her prothorax with the abdominal appendages. He flits about her, when at rest, gradually approaching, and, finally, the female not attempting to avoid him, he poises himself with sufficient accuracy to pick her up by the prothorax, when they fly away together. The female places her eggs among the rubbish and mud along the borders of the ditches.

In central Ohio it occurs from May 15 to September; it is most abundant in June.

It is perhaps true of all of this sub-family, but especially true in case of *maculata* that the males engage in fierce battles. Two combatants will fly about each other, evidently with consuming rage, when one finally appears to have secured a position of advantage and darts at his enemy attempting, often successfully, to tear and damage his wings. These battles often last a long time, until the participants are apparently exhausted. Sometimes a third and a fourth happen along and "take a hand" when the melee becomes general, each doing his utmost to damage any other that he can seize.

1. *Calopteryx æquabilis*, Say.

Length; of hind wing ♂ 32 mm., ♀ 33; of abdomen ♂ and ♀ 40.

The male is metallic green; the following black; the head except the clypeus, thoracic carina, a narrow humeral stripe, more or less on thoracic sutures, the legs and the abdominal appendages. The wings are hyaline, except the tips, with a shade of brown which is golden at certain angles, the tips are deep brown to black, as follows: the anterior with one fourth or one third black, irregular on inner border, the posterior with one third or one half straight within.

The superior abdominal appendages are forcipate, on the inner surface there is a sinus at the middle followed by a stout tooth, the apical portion is thick, apex obtuse, outer margin denticulate; the inferiors are shorter, stout, and straight seen from above, strongly curved upwards, the apex with an incurved apical hook; the surface of these organs is rough and in optical section appears serrate.

The female agrees closely in color with the male, the tip of abdomen becoming brownish with a light band on 8-10; and on sides of 5-10; there are light lines above the thoracic feet. The abdominal appendages are shorter than 10, stout, acute. The wings are lighter apically than in the male; the pterostigma is narrow, not reticulated, milk white.

Compared with *maculata*, *æquabilis* is a little larger, but more slender; the body is more decidedly metallic green; the male appendages are similar, but differ sufficiently, they are rougher, that is, the denticles are more numerous and stouter, the strong tooth on the inner curve is wanting in *maculata*, the inferior are straighter, stouter and rougher than in *maculata*. The wings besides their difference in color are not quite so spatulate; the pterostigma is very different.

Æquabilis has been taken thus far only in the central part of the state in the first of summer. Its habits appear to be similar to those of *maculata* except it has

not been noticed about rivulets. as it prefers the borders of larger streams.

HETÆRINA, Hagen.

As yet two only of the several charming species accredited to America have been taken in Ohio. Others, however, occur in states south and west, so there are still regional species that may be added. In habits they resemble *Calopteryx*; their bronzed body, narrow, hyaline wings with brilliant, basal areas in the males, at once distinguish them.

1. Tips of the wings, especially the anterior, brown; base of fore wings, crimson, hind, brown.....*tricolor*.
2. Tips of the wings of male not spotted with brown; base of both pairs crimson.....*americana*.

Hetærina americana, Fabricius.

Length; of hind wing, ♂ 28 mm., ♀ 30; of abdomen ♂ 36 mm., ♀ 32 mm.

In the males the head and thorax are coppery red, in the fully adult, in younger examples metallic green; the labrum and labium are pale with a black dot in the center of the former; the genæ and mid-dorsal carina are black; there is a white humeral line, a similar one on first lateral suture, a broader stripe at the second suture with the ventral surface and the posterior lateral border of the metathorax white; all the white lines and stripes are bordered more or less with black. The wings are hyaline with a shade of brown at the tips and with the basal fourth bright red except costa of fore wing: these basal patches are pale in the young on the front wings and brown on the hind ones. The pterostigma is very small, yellowish in the young, light brown in the fully adult. The dorsum of the abdomen is metallic green, becoming obscure and coppery with age, yellowish at the sides; the venter is blackish except on 1-2 and 9-10 which are yellowish, there are yellow-

ish narrow interrupted rings on 3-7, and a more or less distinct mid-dorsal, light line on 2-7.

The superior abdominal appendages are forcipated, light below and darker above especially towards the apex; the outer surface is denticulate in the middle; there are two smooth horizontally flattened protuberances on the inner side, the proximal one is the larger, the rounded apices of these processes are directed away from each other.

The inferior appendages are broad at base, then narrow and cylindrical, the truncated apex reaches to the larger tubercle of superiors and bears a stout denticle on its inner angle.

The females have the head, thorax and abdomen metallic green, the last becoming obscure with age. There are markings of other colors as follows; antennæ (except basal joints), a dot in middle of labrum, mid-dorsal carina, the tarsi, the outer side of legs and sternum black; the under side of head and thorax, sides of abdomen (except a dark apical spot), basal interrupted ring on 1-7, a mid-dorsal line on 1-10; basal joints of antenna, labrum, edges of the prothorax, humeral stripe and stripes on the side as in the male, white. The wings are hyaline, costa black, basal third and front margin pale yellowish brown. Pterostigma white, surrounded by black veins. The abdominal appendages and valves are yellowish, the latter tipped with black.

This brilliant gem is peculiarly restricted in its scene of flight. It is rarely observed more than a few feet away from its accustomed habitat, the water's edge. Another notable habit is that of congregating, sometimes in companies of hundreds. These assemblies commence in the afternoon and do not disperse until the warmth of the following day awakens them to activity. Both sexes take part in these assemblies and they rest so compactly that a single sweep of the net

may capture scores of them. A slender, drooping twig of the willow, loaded with these beautiful insects looks like a string of rubies and presents a beautiful picture.

The species occurs throughout Ohio, and it may be found from mid-summer until late in October by running waters, especially where the flow is rapid over rocks and pebbles and the borders are overhung by the spray of willows or coarse aquatic plants.

Hætarina tricolor, Burmeister.

Length of abdomen ♂ 41, ♀ 35, of hind wing ♂ 30, ♀ 30.

Male deep blackish brown, thorax reddish brown, mid-dorsal thoracic carina black, humerals narrow, pale, yellowish apical rings on 1-4; legs black; wings hyaline, tips of all brown, more on hind wings; basal fourth of fore wing crimson, except between the first and second antecubitals, hind wings brown at base except hind margin; pterostigma nearly black, small.

Abdominal appendages black, less forcipate than in *americana*, as long as 10, exteriorly toward the apex there are coarse teeth, within at base a blunt hairy tubercle followed by a blade whose margin is first excavated, then convex and truncated distally; the inferiors are half as long, upturned apically with two terminal sharp tubercles.

The female is bronze green ornamented with pale buff. The face, antennæ, except terminal half which is black, and occiput buff; prothorax has the posterior lobe elevated and rounded in the middle, bordered with buff and with a geminate, orange spot in the middle and with a wash of the same at the sides; thorax green, mid-dorsal black stripe, buff either side uniting with humeral of the same color; sides buff with green spot on each ring; legs green and pale, tarsi black; wings flavescent throughout; ptero-

stigma white. Abdominal dorsum with green and pale and interrupted apical yellow rings on 2-7; ten with a dorsal carina and apical thorn; appendages conical pointed; valves short, dark.

This very handsome species occurs along the Ohio river and ascends the larger streams as far as the central district. It is not rare, but far less abundant in its range than *americana*. It flies much more rapidly than the other, otherwise its habits appear to be similar. It prefers the borders of streams where the flow is rapid.

THE SECOND SUB-FAMILY.

AGRIONINÆ.

This group includes the smallest dragonflies, in fact all Ohio species are small. Not so in tropical America, where representatives are known that are the most gigantic of living odonates.

Our feebler inhabitants of the river bottoms may be seen in numbers on any warm summer day flitting among the sedges of the shallows or busy placing their eggs among floating aquatics. They are not seen flying high in the air or patrolling the beach in search of mates or food, for they seek their kind and prey in the low thickets of aquatic foliage. Many are dull in color, many are brilliant; green, blue and yellow are favorite colors. All are graceful and charming.

The genera may be outlined and limited by the following synoptically arranged characters:

1. Median and submedian sectors arising nearer the arculus than the nodus.....*Lestes*.
Median and submedian sectors arising near the nodus.....2.
2. Bristles on the legs, long,—each about twice as long as the distance from the base of one to the next.....*Argia*.
Bristles on the legs shorter.....3.
3. No ventral spine at end of 8 in the female.....4.
A ventral spine at end of 8 in female.....5.

4. No postocular spots.....*Erythromma*.
Two postocular spots.....*Nehalennia*.
5. The tenth segment of the male a little prolonged above, the process bifid; pterostigmas on fore and hind wings of male of different color.....6.
The tenth segment of male without the superior bifid process (Except in *exulans* and *fischeri*)• Pterostigmas on wings of male similar.....*Enallagma*.
6. No postocular spots.....*Amphiagron*.
Two postocular spots.....7.
7. Pterostigma remote from the costa in the male.....*Anomalagrion*.
Pterostigma normal in position in the male.....*Ischnura*.

LESTES, Leach.

In W. F. Kirby's Catalogue of the odonates of the world, thirteen species of *Lestes* are ascribed to the Nearctic region; of these, eight have been taken in the state and there is, at least, one more that is very likely a resident, Viz: *L. urina* as it has been taken in Illinois and Pennsylvania

Our species belong to three groups, separated by the relative length of the inferior and superior abdominal appendages of the males:

1. Inferior pair shorter than half the length of the superiors,
congener, (*eurina*).
2. The same more than half, but no longer than the superiors:
 - (1) Inferior appendages of the male sigmoid.....*unguiculata*.
 - (2) Same straight, abruptly widened apically.....*uncata*.
 - (3) Same not widened apically.....*disjuncta*.
 - (4) Same gradually and slightly widened, a little larger than *disjuncta*, two teeth on the inside of the superiors, basal one larger, (equal in *disjuncta*).....*forcipata*.
 - (5) Same long, bent downward apically, abomen of the male very long.....*rectangularis*.
 - (6) Same long, very slender not dilated apically.....*vigilax*.
3. The same longer than the superiors apex turned inward,
inæqualis.

Lestes congener, Hagen.

Length: of hind wing, ♂ 18-22 mm., ♀ 22 mm.; of abdomen ♂ 27-31 mm., ♀ 28 mm.

The general color of both sexes is blackish bronze. The labrum, anteclypeus, genæ, under side of the head,

a narrow humeral stripe (sides parallel) the prothoracic borders, mid-dorsal carina (obscure in some) the sides of the thorax and abdomen and stripes on the femora and tibiae yellowish white. There are also whitish apical and basal interrupted rings on 2-7 of the abdomen and a trace of a mid-dorsal white line. segments 9 and 10, rear of head and under parts of thorax in the male are pruinose. The wings are hyaline, pterostigma reddish brown, covering two cells.

The male abdominal appendages are forcipate, longer than 10, reddish on the outside basally, otherwise black, denticulate externally, apex somewhat swollen; on the inner surface there is a strong pointed proximal tooth, followed by a sinus, this followed by a blade, the inner edge of which bears sharp teeth. The short inferior appendages are black with their obtuse apices turned towards the mid-line.

The female differs in having the mid-dorsal line of abdomen plainer than in the male; the humeral stripes wider and the pterostigma lighter. The slender abdominal appendages are light without and black within; the valves are light, with tips and lower edge blackish, serrate and narrow.

Congener probably occurs in the greater part of the state. It has been taken at Columbus in the fall only, flying well into October.

Lestes unguiculata, Hagen.

Length: of abdomen ♂ 28 mm., ♀ 27 mm.; of hind wing ♂ 19 mm., ♀ 21 mm.

The color of the head and thorax blackish bronze above, dorsum of the abdomen metallic green; the labrum, genæ, under parts of head and thorax, greater part of the sides of the latter, and humeral stripe yellowish. The wings are hyaline, pterostigma brown with the ends whitish; the coxæ are light, the femora and tibiae, striped with light and black, tarsi black.

Abdominal segments 1-7 are light on the sides, while the last three are black or bronze throughout, there are narrow interrupted basal rings on 2-7.

The male abdominal appendages are forcipate, brownish at base, black apically, denticulate without, on the inner margin is a blade which is narrow concave at the inner margin and denticulate, this blade is preceded by a sharp backwardly directed spine; the inferiors are black, except on the under side of the swollen base, long and sigmoid.

The female has the appendages slender, reddish with black tips. Her colors differ little from those of the male; the humerals are more conspicuous and widest below, the rear of the head has a yellow band from eye to eye—obscure in old specimens; there is a faint mid-dorsal line on the abdomen, and both sexes are more or less pruinose when adult.

This species has been found very abundant in the northern parts, near the lake and in the central section. It is on the wing from mid-summer until October.

Lestes uncata, Kirby.

Length : of the abdomen ♂ 31 mm.. ♀ 28 mm., of the hind wing ♂ 22 mm., ♀ 24 mm.

The color of both sexes is metallic green, becoming blackish on the last abdominal segments. The following are yellowish white : labrum, genae, clypeus anteriorly, labium, sternum and sides of thorax (except a blackish wash on sides of metathorax), a humeral line, mid-dorsal carina more or less in the female, the sides of 1-7, basal rings on the same, the coxæ, the femora interiorly, and the tibiæ exteriorly. The following are black : the tarsi, exterior of femora, interior of tibiæ apical rings on 2-9, the last two abdominal segments in the male, and the pterostigma which is terminated by white veins.

The female has the sides of the thorax clear yellowish and less black on the abdomen; the appendages are light and the valves black with light shade above; the basal half of abdominal ring 1 is yellow, and the basal rings on 2-7 are interrupted (not in the male).

The superior male abdominal appendages are much like those of *unguiculata*, while the inferiors differ totally, as they are straight with a broad terminal expansion, making them securiform when seen from above.

This species occurs in most parts of the state and in abundance; it appears during mid-summer.

Lestes disjuncta, Selys.

Length: of abdomen ♂ 30 mm., ♀ 28 mm.; of hind wing ♂ 20 mm., of ♀ 22 mm.

Head and thorax blackish brown, abdomen metallic green with the last three segments blackish. The following parts are yellow: lips, genæ, anteclypeus, mid dorsal carina, humeral stripes, sides of thorax, femora interiorly and tibæ exteriorly, sides of abdominal rings 1-7, and narrow, basal, interrupted rings on 2-7 of the female and young males, not discernible in adult males. The sides of the metathorax of the females is blackish, and in the males there is at least a dark wash at the second lateral suture. The humeral is wider in the female, and in both sexes it is narrower above.

The superior male abdominal appendages are black, forcipate, rather coarsely denticulate without, and with two equal acute teeth within, the edge of the blade-like piece between them is straight and serrate; the inferiors are reddish brown, straight, somewhat laterally expanded distally, and concave on the upper side or spoon shaped. The female appendages are of the usual shape, blackish within and at apex; the valves are light with a dark shade through the middle.

Both sexes are more or less pruinose on the rear of head, thorax, base and apex of abdomen.

This species is common and wide spread.

Lestes forcipata, Rambur.

Lenth: of abdomen ♂ 33 mm., ♀ 31 mm.; of hind ♂ 22 mm., ♀ 24 mm.

Color blackish bronze, abdomen brighter.

The following yellowish or greenish white: anteclypens, labrum, genæ, labium, sternum of the thorax, coxæ, stripes alternating with black upon the legs, thoracic carina, borders of the prothorax, sides of the thorax, abdominal joints, and basal interrupted rings on 3-7. The humerals in both sexes are wide, narrower above. The pterostigma is large, blackish brown with the veins at the end whitish. The ninth segment of the male is conspicuously pruinose.

The superior abdominal appendages of the male are reddish outwardly at the base, otherwise black, forcipate, with a few coarse teeth on the outside, within a blade preceded by a stout tooth and terminated by a prominent angle, the blade is followed by a deep rounded sinus. The inferior appendages are reddish, somewhat expanded distally and slightly curved inwards. The appendages of the female are light without and dark within; the valves are black on the lower border and light above.

The species is easily separated from *disjuncta* by its larger size, by the unequal teeth at the end of the lamina of the male abdominal appendages, by the wider humeral stripes about equal in the sexes and by the fact that the inferior male appendages are widened before the apices.

Taken commonly at Columbus, April 24, 1896. Also at Sandusky in June.

Lestes rectangularis, Say.

Length: Abdomen of ♂ 40 mm., of the ♀ 33 mm.; hind wing ♂ 22 mm, ♀ 23 mm.

Head, thorax, and abdomen of the female above and the last four abdominal segments of the male blackish brown: the abdomen of the female is sometimes greenish bronze with a mid-dorsal light line on 1-2 or 3. The anteclypeus, lips, genæ, under parts of the head and thorax, the thoracic carina, humerals, and sides of the thorax are yellowish or greenish white. The legs are pale with black as follows: a narrow stripe (may be wanting) on the exterior of the second and third femora; two on the first pair; also on the inner side of first tibiæ, the ends of the tarsal joints and the claws are brownish. In the female the stripes on the legs are wider and the tarsi blacker than in the male. In the male the top of 1 and 2 are brown; 3-6 testaceous with basal lighter rings and apical darker ones. In the female 1-10 are yellowish on the sides, the same extending over the dorsum as narrow basal rings on 1-6. The superior appendages of the male are testaceous, blackish on apical third, forcipate, no denticles out side; the lamina on the inside is short with long and slender, terminal and minute marginal teeth. The inferior appendages are black, exceeding the lamina of the superiors and bent downward at the end. The appendages of the female are slender, conical, testaceous, tips black. The valves are narrow and black below.

Rectangularis occurs abundantly in all parts and may be recognized by the very long male abdomen and pale color of body and legs.

Lestes vigilax, Hagen.

Length: of abdomen ♂ 40 mm., ♀ 37 mm.; of hind wing ♂ 26 mm., ♀ 27 mm.

Bright metallic green obscure towards the end of the abdomen, and covered by pruinose on rear of head, thorax, base and apex of abdomen in the fully adult.

The males are marked with black, yellowish and bluish white as follows: white—genæ, lips, under parts of thorax, irregular bands before the lateral sutures, humeral line (often faint), in some the edge of the carina, coxæ, trochanters, more or less of the inner side of the femora, and pleuræ of abdominal joints 1-6; black—legs and feet except as mentioned above, antennæ, mid-dorsal thoracic carinæ (its edges sometimes light), and the superior abdominal appendages. The pterostigma is yellowish in both sexes, surrounded by black veins and covers about three cells.

The female differs from the male in having wider humeral, and carinal yellowish stripes, sides of thorax yellow, the light on the femora more pronounced, the light of the abdominal pleuræ extending over the dorsum as narrow basal rings, and the greater part of 9 and 10 yellow,

The superior male appendages are long, less curved than in the preceding species, the ends are somewhat enlarged and obliquely truncated. The blade of the inner side is preceded and followed by a tooth, its edges are not straight but coarsely crenated. The inferior appendages are pale, very slender, and reach nearly to the end of the superior, they are slightly bent inwards at apex. The appendages of the female are yellow, the valves of the same color.

This slender species is very active and graceful in its movements. It has been recorded only for the lake district. In the marshes at Sandusky Bay it occurs in immense numbers.

Lestes inequalis, Walsh.

Length: of abdomen ♂ 39 mm., ♀ 37; of the hind wing ♂ 27, ♀ 28.

Metallic green, with the last three abdominal joints blackish. The markings of yellow or bluish white are as follows: male—anteclypeus, lips, genæ, rear of head, under parts and sides of thorax below, an exceedingly narrow stripe on the carina and humeral suture, two stripes on the femora, most of the tibiæ and the pleuræ of the abdominal segments; there are very narrow basal rings on 3-7. The antennæ, tarsi and stripes on tibiæ and femora are black. The pterostigma is dark brown covering two to three cells. The female differs in having more black upon the legs, the humeral and carinal stripes wider.

The male abdominal appendages are black; the superiors are forcipate with a few spines on the outer curve, within a stout acute tooth precedes the usual blade which is narrow, the edge curved and serrate. The inferiors are slender and strongly bent inwards at apex. The anal appendages of the female are slender, rather long and blackish in some examples, light in others; the valves are narrow and black except on the upper border.

This beautiful species is quite as active and wary as *vigilax*, which it closely resembles, it is easily separated however; the males by their peculiar inferior appendages, bright yellow sides of thorax and absence of humeral strips; the female by the yellow rear of the head, bright yellow on sides of thorax, darker valves and pterostigma and the narrower humeral stripes (sometimes wanting as in the male).

It has been taken only in northern localities.

ARGIA, Rambur.

The species of this genus differ only slightly from those of other genera following, yet they have a "personality" that no observer can long fail to appreciate. They prefer the brook-sides and some of the species rarely wander to other localities; the nymphs live in the

clearer, running waters; to this there is one exception, the young of *putrida* live also in deep water of Lake Erie, and the nymphs swarm about its shores and islands.

Our five species fall into the two groups defined by the number of cells covered by the pterostigma.

- A. Pterostigma covering more than one cell (one and a part of another).....*putrida*.
- B. Pterostigma covering one cell; males as follows:
 - (1). Violet and black, 8, 9 and 10 violet; inferior appendages thick, much longer than the superiors and slightly notched....*violacea*.
 - (2). Bluish and black; 9 and 10 blue; inferior appendages longer than the superior, apex bifid, upper branch longer*tibialis*.
 - (3). Light blue and black; 8, 9 and 10 blue; inferior appendages bifid, branches equal.....*apicalis*.
 - (4) Deep blue and black ; 8, 9, and 10 blue; inferior appendages longer, strongly bifid, branches divaricate, lower longer, stout, ...*sedula*.

Argia putrida, Hagen.

Length ; of abdomen ♂ 33, ♀ 31 ; of hind wings ♂ 24, ♀ 25.

The young are clay colored to light brown, the older males are darker to black obscured by pruinose especially on the head, thorax and segments 9 and 10. Three pale antehumeral stripes, also one on the sides of thorax and narrow pale basal rings on 3-7. Segments 8-10 are somewhat thickened with the last excised, sides of the excision thickened and produced backwards into rounded tubercles. The abdominal appendages are very short, black, the superiors are flattened, obliquely rounded at the end with two teeth on the lower and outer side, one at the lower inner apex, the other on the outer middle face, there is a sulcus between them ; the inferiors are much wider vertically, beveled to an irregular tuberculate edge posteriorly and terminating above in finger-like projection that lies between the tubercles of the superiors.

The young females have a similar coloration to the young males. The fully adults are light blue marked

with black as follows : antennæ, lines about the vertex and frons, lines on the sides and edges of prothorax humeral and second lateral sutures and dorsum of the abdomen. The blue of the sides extend as basal rings on 3-7; ten is blue. The appendages are pale, short and blunt; the valves short, pale smoky below, serrated.

Putrida occurs throughout the State, in vast numbers along Lake Erie and about the islands; it often comes on ship-board far from land. It flies from May to October. The female, usually attended by the male, oviposits on submerged timbers and moss, and alga-laden stones. It is not uncommon, to see the female and her consort descend beneath the water and to remain submerged for what would appear to be a long time.

The following observations were made one day on its habit of ovipositing under water. Five pairs were noted on a timber of a dock; they were from barely covered to six inches under water; the following notes were made at the time.

PAIR 1. ♂ abandoned ♀, emerged and flew away after five minutes, ♂ remained one hour.

PAIR 2. ♂ abandoned ♀ in seven minutes, ♂ remained fifty-five minutes; after exposure to the air for a short time she returned beneath the water for fifteen minutes.

PAIR 3. ♂ remained submerged twenty minutes, ♀ thirty; she flashed her wings and immediately returned for twenty-five minutes.

PAIR 4. They were disturbed, emerged and flew away together.

PAIR 5. They were seen to alight on the dock just above the water and slowly back down until they were covered.

Argia violacea, Hagen.

Length: of abdomen ♂ 26, ♀ 25; of hind wing ♂ 20, ♀ 21.

The color of the adult male is violet ornamented with black as follows: antennæ, dorsum of prothorax in part, mid-dorsal and humeral stripes, the latter bifid beneath the wings, the upper part of the first and the whole of the second lateral sutures, stripes on femora and tibiæ, the sides of 2, apical lateral spots extending as rings on 3-6, all of 7, the abdominal appendages, the venter of the abdomen (widest on 8-10). The sides and venter of thorax, coxæ and greater part of legs pale. The pterostigma of both sexes is light yellow or brown. Wings slightly fumose.

The female has the violet less bright than the male, the younger ones clay colored, the black on sides of dorsum of 2-6 is in bands rather than spots leaving basal rings, however, there is a mid-dorsal line on 7.

In the males 10 is excised as in *putrida* but the posterior angles are not knoblike but sharp. The superior appendages are short, in profile the sides are parallel and the apex rounded, from above they are broader with apex obliquely truncated, beneath they are excavated apically with a stout curved process at the inner angle; the concavity contains a tuft of hairs. The inferiors are much longer and deeper, bifid with the upper, pointed, larger prong directed towards the superiors; the lower, rounded one is directed downward.

The appendages of the female are pale, short, blunt and the valves are also pale and serrate.

The species is common along the borders of ditches and streams. Oviposition takes place as in other *Argias*—often in pairs, on submerged plants and rubbish. It is every-where its proper habitat is found, occurring in mid summer.

Argia tibialis, Rambur.

Length: of abdomen ♂ 27. ♀ 27; of the hind wing ♂ 21, ♀ 22.

Color bronze black variegated with lilac or blue as follows: frons, clypeus, lips, broad stripe each side of thoracic dorsum; sides of thorax with second lateral suture black, more or less of sides of 1-7 more in female, with basal yellow rings on 3-7 in both sexes, the dorsum of 9 and 10 in the male. The legs have more or less of pale, pterostigma dark brown.

The male has 10 incised as in the preceding species, although not so deeply and the sides of the incisions are more nearly vertical. The appendages are short; the superior at first cylindrical then apically divided by a deep groove extending obliquely across it, the upper branch is wide, apex rounded, in profile somewhat wedge shaped, the lower is pointed and recurved downward and inward. The inferiors are stouter, longer, bifid, the upper stouter branch is pointed, the point reaching the groove in the superiors, the lower is smaller situated on the inner side of the former and points downward.

The appendages of the female are very short and blunt, the valves short and broad, dark in color.

This species is not common but has a wide range.

Argia apicalis, Say.

Length: of abdomen ♂ 31, ♀ 30; of hind wing ♂ 23, ♀ 25.

The male is pale blue with black marks as follows: Antennæ, vertex, prothorax except a blue spot each side. inferior humeral, mid dorsal carina, dorsum of 1-6 (the same extends on 3-6 as an apical ring) and the whole of 7. There are basal light rings on 3-7 and an imperfect mid-dorsal on 1-6

The female is light brown until fully adult, then as blue as the male. Her markings differ slightly: the inferior humeral is small or wanting, there is more black on the abdomen; the legs are paler, and the pterostigma lighter.

The superior appendages of the male are short; in profile they are narrow, end rounded, within there are two long teeth, the inner longer, obtuse, the outer acute, they are turned downward and outward toward the inferiors. The inferiors are much longer and stouter, equally bifid, the lower branch conical, the upper stouter, more pointed.

The female appendages are light in color, of the usual form. The species is not uncommon on the rocks along the larger streams. In no other of our species are the sexes so nearly similar.

Argia sedula, Hagen.

Length: of abdomen ♂ 26, ♀ 26; of the hind wing ♂ 18, ♀ 20.

The male is black, marked with deep blue. The frons, clypeus, labrum, postocular spots, the sides of the prothorax and a spot each side of its dorsum, antehumeral stripes, the sides of the thorax (divided by a black line on second suture) stripes on femora and tibiae (pale like sides of thorax) the sides and apex of the first abdominal ring; the sides, two basal dorsal spots on two, basal rings on 1-7, the whole of 8-10 and sides of 3-7. The wings are slightly fumose, pterostigma light brown.

The female is clay colored and light olive, differing totally in appearance from the male; her wings are a little more fumescens and the stigma lighter.

The superior male appendages are longer than those of the preceding species, and are somewhat curved within, the ends are rounded with a pointed tooth on the lower inner angle and another on the

abdomen somewhat broader. The sides of 9 and 10 are bluish, there is more or less of an apical spot on 8 and the posterior border of 10, both blue. The green on 7-10 both sexes is obscured with blackish.

The posterior border of the prothorax of the male is faintly lobed; on either side there is a shallow sinus and in the middle a broad process with its upper border sinuate. That of the female has three large, round lobes, subequal, the middle rounder.

The posterior border of 10 is excised, denticulate in the male. The superior appendages are very short, black, with two branches; the upper outer one is broad, obtuse, hairy; the lower more cylindrical, slenderer, apex obtuse; these branches are somewhat twisted on each other like the parts of the beak of the cross bill; the lower branch appears to be movably articulated to the upper. The inferior appendages are a little longer, turned upward and inward ending in a black denticle. The female appendages are short, thick, cones, yellow; the ovate valves are yellow with black processes.

It occurs about cool springs and streams of cool quiet water in mid-summer.

Nehalennia posita, Hagen.

Length: of abdomen ♂ 19, ♀ 19; of hind wing of ♂ 12, ♀ 14.

Blackish bronze marked with bright yellow or greenish yellow. The anterior border of the frons, base of antennæ, genæ, anterior half of labrum, under parts of head, humeral stripe which is interrupted, sides of thorax, anterior border and sides of prothorax, legs, under parts and sides of abdomen, apical ring on 1, basal rings on 2-7, and geminate basal spot on 9 yellow.

The postocular spots are round and greenish yellow; the second lateral suture is black; there are also black stripes on the legs and rings on the tarsi.

The female has the marks a little paler than the male.

The tenth segment of the male is short, posterior border with a forked upturned process. Superior appendages very short, yellow, thick above, a tooth at the superior angle (upper branch), the organ then turns downward and inward, becoming thin below and ending in an obtuse angle. The inferior appendages are about the same length, arise from a thick base, then narrow to a hand-like termination, the fingers of which are represented by five corneous denticles. The appendages and valves of the female are yellow, the processes short and dark.

This pretty species appears early and remains until late in September. It is abundant throughout the state.

AMPHIAGRION, Selys.

This is a genus of one species; one that ranges from equatorial America, at least as far north as Lake Erie and on the Atlantic Coast to Maine. In central Ohio it is extremely common about runs from springs. It occurs throughout the state.

Amphiagron saucium, Burmeister.

Length: of abdomen ♂ 18, ♀ 17; of hind wing ♂ 14, ♀ 15.

Red and dull black. Male, top of head black, anteclypeus, genæ and labium red, under parts of head, thorax and legs pale reddish, the latter with or without faint black lines; upper part of prothorax and thorax black; pterostigma reddish; segments 1-6 wholly red, 7 partly, the rest entirely blackish. Female, head as in the male except the black gives place to reddish on the rear; thoracic dorsum with a

broad stripe of black abdominal rings 3-9 with more or less black apically above, 10 reddish. All colors paler.

The posterior border of ten in the male has a deep round sinus; the appendages are about equal to 10, the lower longer than the superior; the superior has the upper branch prismatic, short, ending within in a stout denticle; the lower branch is finger-like in profile, turned down, obtuse, from above the two are lyre-shaped. The inferiors have a thick base and taper to an obtuse angle, sides straight. Both are rufous. The female appendages are short cones, rufous, the valves narrow, pointed, the processes short and rufous.

It is not unusual to find examples of females much larger than the average given above.

ENALLAGMA, Charpentier.

This genus comprehends moderate sized species of singularly varied and beautiful colors and our fauna is comparatively rich since thirteen species have already been captured within the state. They appear to take the place occupied by Agrions in Europe. Several of these charming and abundant forms appear early in the season, and representatives of the genus are abroad until late in September.

The species may be arranged in two groups or divisions on obvious characters, as follows;

1. Males with an apical spot* on the dorsum of the second abdominal ring; female with the dorsal band the entire length of 2.

2. Dorsum of 2, in both sexes, with a band; in the female 10 is blue or green.

*Individuals in certain species of this division have this spot covering much of or the whole of the dorsum of 2, but anteriorly it is always narrow

FIRST DIVISION.

The species of this group are all blue or green and black, or greenish and pale when teneral. They have three antenodal cells (Selys) and can be most easily separated by the character of the abdominal appendages of the male seen in profile:

- (1). Superiors with two equal branches, separated by a deep rounded sinus; inferiors as long.....*ebrium*.
- (2). Superiors as long as 10, the upper branch long, stout, decurved apically, lower very short directed downward; the slender inferiors reaching the lower branch of the superiors.....*aspersum*.
- (3). Superiors longer than 10, the upper branch more slender than in *aspersum*, the lower directed downwards and inwards: the inferiors reaching nearly one third of their length beyond the lower branch of the superiors.....*traviatum*.
- (4). Superiors exceeding half of 10, broad, excavated at distal extremity, sinus occupied by a large, pale, tubercle, lower angle (branch) prominent.....*civile*.
- (5). Superior appendages similar to the last, a little shorter, less wide apically in profile, the lower angle not so prominent.....*carunculatum*.
- (6). Superior appendages short, wedge-shape, slightly curved upward at apex; inferiors decidedly longer, upper edge straight,.....*hageni*.
- (7). Superiors relatively somewhat longer than in the last, base thick, apex turned down and within; inferiors slightly exceeding them.....*geminatum*.
- (8). Superiors short, upper branch short, distally rectangular, lower branch longer, directed upwards, obtuse; inferiors as long as upper branch.....*doubledayi*.

SECOND DIVISION.

The species are blue and black (*exsulans* and *divagans*) and orange or green and black (*signatum*, *pol-lutum* and *fischeri*.)

They are separable as in the former group by profile view of the male abdominal appendages.

- (1). Superiors half as long as 10, two branches, upper thick, lower longer, slenderer, sinus deep; inferiors acute, as long as upper branch of superiors.....*exsulans*.
- (2). Superiors less than half of 10, scarcely divided, upper part thick and rounded, lower slender directed downward; inferiors a little longer.....*divagans*.

- (3). Superiors more than half of 10, two widely divaricate branches, the upper thicker, slightly longer; inferiors a little shorter than the inferior branch of superiors.....*fischeri*.
- (4). Superiors longer than 10, end obliquely truncate with a tooth (lower branch) at outer third; inferiors slender.....*signatum*.
- (5). Superiors shorter than 10, securiform; inferiors as long as lower angle of superiors, very slender.....*pollutum*.

Enallagma ebrium, Hagén.

Length: of abdomen ♂ 25, ♀ 23; of hind wing of ♂ 17, ♀ 18.

The male is bright blue marked with black. The occiput, vertex, antennæ, and postclypeus are black; occipital spots large ovate and connected, the prothorax has a line on sides, posterior border and an ovate spot each side blue; thorax with a broad mid-dorsal, humeral and greater part of legs black; black on abdomen as follows: square basal spot on 1, apical spot and ring on 2-6 (these spots are successively larger, pointed anteriorly and occupy from one fourth to one half of the dorsum of the joints), the whole of 7 and 10, and the appendages. The female differs in the ground color which is yellowish green, the black markings of head and thorax are similar to those of the male, the legs are lighter, the pterostigma is light yellow, the entire thoracic dorsum is black except interrupted basal rings on 2-7.

The superior male appendages from above are divaricate, curved toward the middle-line and have a pointed hooklet just before the end within; in profile bifid, the upper branch straight, stout, obtuse; the lower narrower curved down then up making the sinus broad and rounded. The inferiors are as long as the superiors, curved slightly upward and inward, they are blue at base then black.

The female appendages are stout, about the length of 10, pale and the valves including the process yellow. The black sternal line includes the ventral spine of 8.

This species is exceedingly abundant along the marshy borders of Lake Erie. Common in June, by the end of July pretty rare. The female oviposits among floating *Utricularia*, algæ and stems of aquatics.

Enallagma aspersum, Hagen.

Length: of abdomen ♂ 25, ♀ 24; of hind wing ♂ and ♀ 18.

Male, blue and black; head black, front and rear blue, there is a black line at the base of the labrum and a broader one between the frons and clypeus; prothorax black, sides posterior border and triangular spot each side the dorsum blue; thorax blue with a moderately wide mid-dorsal and humeral stripe black; tarsi black, legs striped with black and pale blue; pterostigma black; abdomen blue with much black as follows: basal quadrate spot on dorsum of 1, a shield-formed apical one on 2 with apical black ring in connection with it, apical two thirds of dorsum of 3, entire dorsum of 4-6 except narrow interrupted basal rings, basal half of 7 and dorsum of 10. Female has the blue lighter, large ovate occipital spots, more black on the front of head, prothorax with very little blue, dorsum of 1-10 more or less black, apical blue ring on 1, basal interrupted ones on 2-6, large oblong blue patch covering basal two thirds of each side of dorsum of 7, and much smaller ones similarly placed on 8. Pterostigma lighter.

The superior appendages of the male are black divaricate, nearly as long as 10, curved inwards with an internal hooklet before the obtuse end; in profile the upper branch has the end rounded obliquely and capitate; lower branch short, directed downwards and backwards, apexes turned inwards. Lower appendages directed upwards, as long as the lower branch of superiors. The appendages of the female are black cylindrical, ends obtuse; the valves are narrow, pale, with the processes black.

This pretty species has been taken on the herbage about ponds, and flying over water, in central and northern Ohio in May and July.

Enallagma traviatum, Selys.

Length of abdomen ♂ ♀ 24; hind wing ♂ 17, ♀ 18.

Male blue and green. Head green, sometimes appearing blue, black as follows: stripe connecting the bases of the antennæ and the anterior ocellus, a stripe behind the ocelli produced laterally and divided on a level with the antenna sending one branch to the antenna and another to the compound eye, this latter is continued backwards along the margin of the eye and returned on the posterior part of the head and so surrounds the postocular spot on each side; a stripe connecting the ocelli, a dash in front of the anterior ocellus and a small point each side on labrum. Thorax with a mid-dorsal stripe composed of three fine lines and a humeral stripe, black. Legs pale, in most specimens a black line on the outer side of all the femora, abdomen blue, dark green as follows; an angular dorsal spot on 1, a patch strongly widened posteriorly and an apical ring on 2, whole dorsum, strongly narrowed or interrupted at base, on 3-7, a triangular basal patch on 8 and the whole dorsum of 10. In dry specimens these colors become faded and their outlines are hard to follow. The superior appendages of the male are much like those of *aspersum*, but are slightly longer and narrower; the inferior branch on each side is produced downward and inward towards the middle line so that the apices are separated only by about the width of the superior branch. The inferiors protrude about one third of their length beyond the apices of the inferior lobe of the superiors.

The female is colored similar to the male, but the following are noticable differences. The three fine black

lines forming the mid-dorsal thoracic stripe are separated by pale yellow, the dorsal patch on 8 is longer, reaching more than half the length of the segment, and the whole dorsum of 10 is blue.

The males are separated from those of *aspersum* by coloration of the abdomen. In the latter species one-half of 7 and all of 8 and 9 are blue, while in *traviatum* only 8 and 9 are blue.

The females of *aspersum* have a blue patch reaching three-fourths the length of 7 on each side, and a round spot on each side of the base of 8, blue, while *traviatum* has 8, 9 and 10 blue with the exception of the dark green basal patch on 8.

The species has been taken at Cincinnati (Dury) and at Akron in June. Seemingly common in various parts of the State.

Enallagma civile, Hagen.

Length: of abdomen ♂ 26, ♀ 28; of hind wing ♂ 19, ♀ 21.

The male is blue and black. Head with blue, as follows: large postocular spots, genæ, transverse stripe on frons below, clypeus except a black line at base of post-clypeus and labrum; the prothorax has the posterior edge blue; the legs are striped with pale blue and black, the tarsi faintly ringed with dark at distal ends of joints; pterostigma dark brown; abdomen with black as follows; square dorso-basal spot on 1, apical shield and ring on 2 occupying half the dorsum, apical third of 3-5, half of six, all of 7 except basal interrupted ring and the dorsum of 10 including the appendages.

The female differs in having the blue ground color usually paler, some individuals remaining with the pale or brownish teneral color, more black on the head, and the dorsum of all the abdominal segments black.

The male abdominal appendages from above are about the length of 10, divaricate, compressed, obtuse with a small denticle before the end on the inner side; in profile wider apically excavated, lower angle, (or branch) prominent, nearly as long as the upper slightly decurved branch, projecting from the apical excavation is an ovate, pale tubercle, the organ is slightly constricted at the middle. The lower appendages are curved upward, attaining the lower angle of the superior appendages.

The female appendages are rather long cylindrical, pointed; the valves ovate narrow, processes black.

This beautiful species appears to occur throughout the state and to be common in June especially south.

Enallagma carunculatum, Morse.

Length: of abdomen ♂ 27, ♀ 27; of hind wing ♂ 20, ♀ 21.

This species closely resembles the preceding so closely, indeed, that both have stood under one label in the cabinets of specialists for years until Morse separated them by naming and defining the present species in 1895. Now that the differences have been pointed out, the wonder is that experts could have united them. The females are distinguished with more difficulty than the males.

The males are separated readily, first by dorso-abdominal spots and second by the abdominal appendages. In *carunculatum* the apical black on rings 2-7 covers two thirds their length, in *civile* only one third; again the superior appendages are shorter, less compressed, hence more nearly cylindrical, the apex less spreading so that the tubercle which occupies the sinus is not so broad vertically, the tubercle is different in shape being narrow and curved like a new moon with rounded ends, and it lies in a groove on the inner lower face of the appendage.

Carunculatum is equally or even more abundant than *civile* especially in the northern parts of the state where lakes and reservoirs abound. It has been noted in myriads about Mercer county reservoir and at Sandusky Bay in July. At the latter place *civile* becomes common and practically disappears while *carunculatum* is numerous. It remains late in the season after most other species of the genus have disappeared.

Enallagma hageni, Walsh.

Length: of abdomen ♂ 13, ♀ 24; of hind wing of ♂ 16, ♀ 17.

The male is blue and black; head black above, while the genæ, labrum, anteclypeus lower border of frons, and long and narrow postocular spots are blue; prothorax black with posterior edge pale blue, mid-dorsal and humeral stripes black; legs bluish, femora and tibiæ black outwardly, tarsi dark at the articulations, pterostigma black. The dorsum of abdomen is black, as follows: a square basal area on 1; a round apical with ring on 2, apical one-third on 2-4, one-half of 5-6, all of 7 except interrupted basal ring and all of 10, including the appendages.

The tenth ring of the male is deeply excavated, the superior appendages are half as long as 10 depressed, quadrangular seen from above, apical side slightly concave with a soft tubercle projecting slightly beyond, making the outline somewhat convex, inner side with broad process at base, then concave to the angle which projects slightly inward, the outer angle is slightly rounded. On the upper surface there is a diagonal ridge from the inner apical angle; the inferiors are longer than superiors and forcipate; in profile the depressed superiors are curved upwards somewhat apically; the inferiors are straight on the upper border, apex slightly up-curved, lower border first convex, then concave then

convex. The surface of both appendages are tuberculate, more marked on the inferiors.

Hageni has been taken in few localities and always about ponds and "cat holes"; it must be regarded as uncommon or rare.

Enallagma geminatum, Kellicott.

Length; of abdomen ♂ 20, ♀ 19; of hind wing ♂ ♀ 15.

Male. Head: labrum and brows blue, clypeus and vertex black, post-ocular spots cuneiform, not connected, blue; prothorax black edged with blue, scarcely bilobed. Thorax black above with a blue stripe each side (this is sometimes divided as in *N. posita*); sides blue with a black line on the suture. Wings hyaline, pterostigma black; legs black and pale, tarsi black. Abdomen brassy black, blue as follows: 1, apical ring and a lateral spot connected with it; 2, a basal ring interrupted dorsally, this ring is sometimes very wide and the interruption also, there is a lateral stripe connected with the ring; 3-6, basal interrupted rings; 8-9, wholly; abdomen beneath pale blue with brown shades apically; the abdominal appendages are black, agreeing very closely in form with those of *divagans*; they are relatively stouter, and from above the outline is more oblong; there is a sharp tooth on the lower edge of the inner face, the upcurved apex of the lower branch (referring to the type *exsulans*) is a little stouter, and more obtuse than in *divagans*, while the upper one is a little less prominent; the inferior appendages are a little longer than the superior with the acute apex curved upward and inward.

Female. Very similar to the male. The blue of the front of the head of the male is pale blue or brownish; the post-ocular spots and humeral stripes a little paler; the abdomen is black above, the sides pale blue,

sternal membrane black; there is an apical ring on 1; 3-7 have a basal pale blue ring with a wide interruption dorsally; on 8 there is a large blue spot on either side, these are separated dorsally by a black line of varying width; the appendages are black, the valves pale or faded brown.

This pretty and smallest species of the genus in our area is abundant from the latter part of May until well into September; it occurs in all parts of the state and has been taken from New York to Illinois. The females are often as deeply colored as the males. Both sexes may be found in the warmest part of the day flying low over floating herbage.

The female oviposits very much like *Ischnura verticalis* among algæ and debris at the surface of still water.

Enallagma doubledayi, Selys.

Length: of abdomen ♂ 25, ♀ 24; of hind wing of ♂ 17, ♀ 18.

The male is blue and black. Head black with lower part of face blue, a black line on clypeo-frontal suture; prothorax black, posterior edge blue, thorax with usual mid-dorsal and humeral black stripes, legs with blue and black, tarsi black, pterostigma black; abdomen much like that of *hageni*: first ring with small basal patch on dorsum, on 2 a shield-formed one with apical ring, 3-5 with apical one third black, 6 two thirds, all of 7 and 10.

The female differs from the male as follows; on the thorax and head she is yellowish, where the male is blue, her legs are pale with the apical half of the femora blackish outwardly and her abdominal segments are green above.

The abdominal appendages of the male are short projecting beyond 10 equal to half of its length; the superiors arise from a broad oblique base, become

narrower (more abruptly and deeply on the inner side) then expand to a broad, truncated slightly concave termination, a pale, depressed tubercle projects beyond giving a convex outline, the inner angle of the chitinous part is acute and slightly recurved; cephalad of this angle the anterior end of the obliquely placed, compressed, pale tubercle projects at an obtuse angle: in profile the appendage has the upper and lower sides nearly parallel, the end truncated at nearly a right angle with edges rounded, the tubercle projecting below and beyond making the outline rounded and projecting upward beyond the upper truncation. The inferiors are light at base, black at apex, rather slender shorter than the superiors, directed upward, base broad concave or sinuous below.

The appendages of the female are dark brown, conical.

The species has been taken at Columbus in May.

Enallagma exsulans, Hagen.

Length: of abdomen ♂ 27, ♀ 26; hind wing of ♂ 18, ♀ 20.

The male is bright blue and black. The head is black above with wedged-shaped; connected postocular spots blue, face blue with post-clypeus and a transverse band at base of labrum black; prothorax black with transverse line in front, the sides, spots upon the posterior border, a triangular spot each side of the dorsum, and a geminate oblong one between them; thorax blue with wide mid-dorsal, and humerals black, legs black with pale stripes, tarsi pale with dark rings; pterostigma brown pale edged. Abdomen slender, blue with black on the dorsum as follows: much of 1, a narrow band on 2 widest apically, the whole of 3-7, except interrupted apical rings, a narrow band on 8 not reaching the apical border, and on 10 often much narrowed posteriorly. The female is green and black; head and pro-

thorax marked as in the male; the humerals have a bright brown stripe through the middle covering both sides of the suture; legs paler; pterostigma yellow; dorsum of abdominal segments 1-8 black with apical rings 2-7, segments 9 and 10 are blue with two triangular, basal, black spots on 9, or nearly as often with a single spot covering from one third to two thirds of the top of the ring.

The border of 10 in the male has a bifid process above; the abdominal appendages are black, about half as long as 10, bifid, hairy; from above the sides of the upper branch are nearly parallel, obtuse, outer angle rounded, inner acute and recurved, the lower branch thicker, longer, obtuse, smooth; in profile both branches are obtuse, the upper shorter, the whole with the appearance of a clumsy hand of a cray fish.

The inferiors are black, curved upwards, shorter than the lower branch of superiors. The appendages of the female are very short, conical, blue; the ovate valves and processes are pale.

Exsulans is one of the most common and graceful species of the *Agrions*. It occurs everywhere, from June until September about all sorts of water living and stagnant.

Enallagma divagans, Selys.

Length: of abdomen ♂ 23, ♀ 24; of hind wing ♂ 16, ♀ 19.

The male is blue and black. Head black, blue, as follows: narrow, ovate connected occipital spots, front except post-clypeus and base of labrum; prothorax black with anterior lobe blue, a triangular blue spot each side of the dorsum of the posterior lobe and a dot of blue on the posterior margin; thorax black with narrow parallel stripes,—one each side, legs blue and black, pterostigma dark brown with lighter borders.

Abdomen slender, blue, dorsum black as follows: narrow band on 1 and 2, whole dorsum of 3-7 and 10, except narrow basal blue rings on 3-7. Female differs slightly, blue paler or greenish, legs paler, pterostigma yellow, humerals black with a bright brown streak along the suture (narrower than in *exsulans*), dorsum of abdominal segment 1-8 black, a large basal spot on 9 black, the whole of 10 blue.

The posterior margin of 10, in the male, with two processes above; appendages black, short, upper branch swollen, small process on inner upper angle, from the outer side below arises the lower branch which is slender, incurved, directed downward and bears a light cushion on the inner surface; the lower appendage is slender, acute, arises from a wide base longer than the lower branch of the superiors. The female appendages are short cones, black; the valves pale.

This species appears to be rare in most parts of the state.

Enallagma fischeri, Kellicott.

Length: of abdomen ♂ ♀ 24 mm.; hind wing, ♂ 17 mm.; ♀ 19 mm.

Male black, orange, green and blue. Labrum, anteclypeus, genæ and frons orange; the labrum has three black points at base; vertex, occiput, upper part of eyes and antennæ black; cuneiform post-oculars connected and greenish blue; head below pale yellow. The prothorax is black above, with orange or green, as follows: anterior lobe with a broad transverse line, middle lobe with a geminate spot in the center and a larger spatulate one each side, the posterior lobe with three small spots below and on sides pale orange. The "thorax" bronze-black with dorsal carina (sometimes only anteriorly) and humeral stripe bright orange; the legs yellow, with a black line on the outside of the femora and tibiæ (these lines are lightest on the hind pair).

The wings are hyaline, pterostigma small, reddish brown. The abdomen is slender, yellowish-green; dorsum of 1-8 and 10 bronze-black, 9 blue, sides and below yellowish-green anteriorly and bluish posteriorly; the tenth segment is prolonged and bifid to about the same extent as in *Enallagma exsulans*; the superior anal appendages are one-fourth shorter than 10; black, bifid, the upper branches divaricate, curved inward and bearing a minute hook at the inner distal angle; the inferior branches are stouter, shorter, obtuse, converging with a slight curve outward the inferior appendages are yellow, tips blackish, they turn outward and upward so that the tips rest in the forks of the superiors.

Female.—Head as in the male, except that the colors are less vivid; prothorax and thorax are similar except the mid-dorsal carina is more strongly marked with yellow; pterostigma lighter; abdominal dorsum is wholly bronze-black, although somewhat narrowed on 1, 2, 9, and 10, below greenish-yellow, ventral spine on 8 prominent, valves yellow.

Fischeri is an abundant and elegant insect, occurring throughout the state in the early part of summer.

Enallagma signatum, Hagen.

Length: of abdomen ♂ 28, ♀ 27; of hind wing ♂ 18, ♀ 20.

The male is dark yellow and black. Yellow on the head as follows: narrow, parallel, connected occipital spots, frons, clypeus and lips—there is a black point at middle of base of labrum and some irregular patches of same on postclypeus—prothorax black with sides, posterior border, a spot each side and a geminate one in the middle line yellow; thorax yellow with wide bronze black mid-dorsal and humeral narrowest above; legs and pterostigma yellow. Abdomen yellow marked

with black on the back of 1-8 and 10, basal yellow rings on 1-7.

The male abdominal appendages yellow, tips black, longer than 10, compressed; from above sides parallel, end round internal tooth; from side upper line straight lower divergent, shortest, hence the end is obliquely truncated with tooth at lower angle; inferiors slender curved inwards, much shorter than the superiors.

The female has the same general colors, usually a little paler; the post-clypeus is all black, the legs are yellow but have narrow black stripes; the dorsum of rings 1-9 are black, 10 yellow, sometimes the apex of 9. The slender appendages are all yellow, valves and processes the same.

Signatum is very numerous about canals, slow rivers and ponds.

Enallagma pollutum, Hagen.

Length of abdomen ♂ 29, ♀ 29; of hind wing ♂ 19, ♀ 20.

Male bright yellow, greenish yellow, pale blue and black. The occipital spots are long, narrow, connected greenish-yellow; the frons including the antennæ and rings or half rings about the ocelli, face and lips, except two transverse black lines in the postclypeus and three points at base of labrum yellow; prothorax yellow below and on sides, top black with large anterior spot, one on each side, another double one in the middle and the posterior edge yellow; the thorax is yellow with black mid-dorsal and a narrow humeral with irregular edges, the humeral is sometimes a mere brown stain; the legs are yellow with spines and rings on tarsi and claws dark brown. Abdomen attenuate wider posteriorly, dorsum black as follows: 1, except apical yellow ring, all of 2-8 except basal bluish ring on 3-7 (9 is blue), 10 with a cross of black, the rest blue.

The abdominal appendages are yellow, brownish above and at tips, about the length of 10. In profile the superiors are securiform; on the upper side curved upwards, truncated obliquely from below upwards and extended downwards at lower angle; from above the outer side is nearly straight, the inner concave, end obtuse with a projecting edge before the end on the inner side, inside below there is a cushion-like process exceeding the posterior edge making the same convex, this process turns forward and ends in a free curved piece resembling a halfclosed hand. The inferiors are slender curved inwards, much shorter than the superiors.

The female has the same colors as the male, although the yellow is not so bright, the head is similar marked; the yellow areas and spots of the prothorax are larger; the thorax has a mid-dorsal black stripe, the humeral suture is black with a brownish wash on each side but no real humeral stripe, the femora have a dotted line and a solid line of black, the tibiæ have an interrupted black line. Abdominal rings 1-9 are black dorsally with the usual interrupted basal rings; all of the dorsum of 10 and the posterior margin of 9 are bluish.

The conical appendages are dark and the valves and processes light.

Pollutum is exceedingly abundant along borders of marshes, on shores of Lake Erie and the larger interior lakes.

ISCHNURA Charpentier.

Three species of this genus occur in Eastern America,—*ramburii* along the Atlantic coast, *prognatha*, Virginia and *verticalis* everywhere. Only the last has been detected in the West. These forms are small, characterized by a black anterostigma on the fore and hind wings, the hind wings is darker than the fore wings, a fact which separates them from the next.

Ischnura verticalis, Say.

Length: of abdomen ♂ 20, ♀ 21; of hind wing ♂ 13, ♀ 15.

These measurements are averages of a series, but individuals are found which are much larger and others that are smaller.

The male is green, bronze, black and blue. The top of head, post clypeus, base of labrum and antennæ are black, the rest green including the round occipital spots; prothorax black with anterior edge and sides green; dorsum of thorax black with narrow green stripes each side (sometimes interrupted as in *N. posita*) the rest green, legs greenish with black stripes on femora and tibiæ, tarsi and claws ringed with brown; pterostigma of fore wings brown, hind wings light yellow. The abdomen is green below and on sides extending as interrupted basal rings on 2-7; the dorsum of 1-7 and 10 are otherwise black; 8 and 9 are blue with a lateral half band on each black. The posterior dorsal edge of 10 has a bifid upturned process; the superior appendages are black above, depressed, turned downwards and inwards, expanded apically, the angles rounded especially the inner; the inferiors are longer, light below, black above, curved inwards; in profile they are bifid, the upper branch short and erect, the lower slender straight.

The females are of two forms (a) black and green (pruinose) (b) orange and bronze black.

(b) Top of head, postclypeus, base of labrum black, anteclypeus greenish. rear of head orange including the large connected ovate occipital spots which are confluent below with orange of rear of head. Thorax as in male, bright orange taking the place of green. Legs yellow with narrow stripes on tibiæ, and rings on tarsi and claws black. The 1 and 2 are all orange except more or less of an apical ring, 3 orange except a narrow dorsal band on posterior two thirds. All the others

greenish yellow on sides and black on dorsum; valves and short appendages, orange, processes black.

(a) Pale green and black as in male, the whole covered with a bluish bloom; the apex of dorsum of 2-7 darker, 8-10 darker, appendages and valves pale, processes blackish. Pterostigma on all wings light yellow.

Verticalis is without question the most abundant and ubiquitous species. It is one of the first to appear and one of the last on the wing in the fall. It may be found about all sorts of water courses and ponds.

ANOMALAGRION, Selys.

There is but one species in the genus and that is American occurring in both North and South America. It has been found in many quarters of the state.

Anomalagrion hastatum, Say.

Length: of abdomen ♂ 18. ♀ 20; of hind wing ♂ 10, ♀ 12.

Male is black and yellow; the head is black; yellow as follows: minute occipital spots, genæ, base of antennæ, front, anteclypeus, labrum, except black line at base, and the underparts; prothorax black with yellow broken lines on the borders; thorax black with two narrow white lines, yellow on sides and below, legs yellow black half stripe on femora, traces on the tibiæ. Pterostigma of anterior wings are ovate, on hind wings black rhomboidal. Abdomen is yellow, black bronze as follows: dorsum of 1-3, basal lance shaped and apical shield-shape spots of 4 and 5, the whole of 6 and basal half of 7.

The posterior margin of 10 has a long bifid spine.

The appendages are half as long as 10, yellow; superior appendages from above bifid, inner branch broad rounded, outer narrow, straight, pointed,

longer; the inferiors are stout, curved upward and inward, black at tip.

The female orange and black, head black and orange, pattern as in the male except the rear is orange; prothorax black with light lines on margin, sides orange; thorax orange with a wide mid-dorsal spot black; pterostigma light yellow; abdomen orange black as follows: small triangle in middle of 1, same at base of 2, rings at apex of 2-4, all of 5-8, basal triangles each sides of 9. The appendage and valves orange, the extreme tips of the processes black.

THIRD SUB-FAMILY.

GOMPHINÆ

This group includes species of strong individuality, their form and habits are unlike those of other groups.

The rigid spike-like abdomen, rather small and separated eyes are characters that define them without mistake. Among them are our bulkiest species, none are really small. Their habitats are various: some are found only about the rapid streams or waved tossed lakes, others by the reedy pools, while others haunt the sloughs mantled by lily-pads. They do not fly about in apparent sportiveness as do the *Libellulas*; the females rest among the adjacent foliage, or on the ground in some near by pathway; repairing at intervals to the water's edge, or skimming the roughened surface of the rapid stream or disturbed lake for oviposition; the males rest nearer the water, skirt the bordering aquates, or explore the water far from shore in search of the ovipositing females. Copulation is at rest in low herbage or high up in trees. The female oviposits unattended by the male and the eggs are washed from the tip of the abdomen by repeated dips into the water, either in some

quiet nook among the weeds or in other species far out on the rough surface of swift stream or wind disturbed lake. Most species fly in early summer, some in mid, and a few late in summer.

The genera represented may be defined and separated as follows:

I.

Median lobe of the labium bifid.

A. Basilar space free; triangles of front wings crossed; females with genital valves. (*Legion*, *Petaluria*, Selys.)

1. Triangles of the front wings with the upper side longer than the inner, outer longest; superior appendages of the male much widened beyond the middle; pterostigma very long, *Tachopteryx*. (Not yet taken in the state.)

II.

Median lobial lobe entire.

Basilar space free; female without genital lobes.

B. A part or all of the triangles crossed, membranule small or wanting. (*Legion Gomphoides*, Selys.)

1. Legs long, hind femora reaching to the apex of 2; triangles crossed; internal and supra triangular spaces free.....*Hagenius*.

C. Triangles and supratrangular spaces free; membranule very small or wanting. (*Legion Gomphus* Selys.)

1. Inferior appendages bifid, branches nearly contiguous, straight, up-curved at apex.....*Ophiogomphus*.
2. Inferior appendages of the male bifid, branches divergent; superiors but little longer than 10, divergent. Vulvar lamina considerably shorter than 9.

(1). Hind femora of moderate length with many short spines,
Gomphus.

(2). Hind femora long (reaching apex of 2) spines many with an inferior row of 5-7. Much longer than the rest,
Dromogomphus.

HAGENIUS, Selys.

There is only one known species in North America; this is fairly common, at least in Northern Ohio. It prefers the borders of sluggish streams and bayous.

Hagenius brevistylus. Selys.

Length: of abdomen ♂ and ♀ 55-60; of hind wing ♂ and ♀ 48-52.

The male is black and yellow. Head yellow, black as follows: occiput (rear yellow), vertex, base of frons antennæ, lines between frons and clypeus and at base of labrum. There is a stout vertical cone each side; the occiput is convex with a marginal fringe of black hairs. Prothorax relatively small with a geminate spot in the middle posteriorly; the dorsum of the thorax is black with yellow marks; semi-collar, short mid-dorsal carina, narrow curved line each side, narrow humerals; the sides are yellow with two parallel black bands in the middle separated by a yellow line, the latter interrupted at the metathoracic stigmata; the last thoracic is posteriorly edged with black. The legs are black, coxæ with yellow spots. The wings are slightly flavescent, costa yellow to the pterostigma which is long 5 mm., yellowish, covering 6-8 cells. The abdomen is black with a mid-dorsal yellow band on 1-8, more or less interrupted at apex of 3-7, on 8 there is a large basal trowel shaped triangle; the sides of 1-9 are yellow; 8 and 9 are slightly expanded laterally; the yellow on side of 8 occupies the entire length, on 9 it is lunate, shorter than the ring.

The abdominal appendages are shorter than 10, black. The posterior border of 10 is straight, superiors wide apart, slightly curved inwards, outer angle rounded, apex obtuse; in profile the upper border is curved downwards, apex prolonged in a sharp spine, anterior to it near the inner border there is another shorter and stouter one, and on the outer edge near the base there is a downwardly and outwardly directed process. The inferiors are united, broad, apex slightly excavated, apex directed upwards.

The female is very similar; 8 and 9 are considerably expanded laterally; appendages black, as long as

10; vulvar lamina covering one-fourth of 9, black, apex excavated, angles sharp.

OPHIOGOMPHUS, Selys.

There are several closely related forms of this group of elegant species. One only has been captured within our limits. It occurs in early summer about swift water of larger streams, usually flying with and in a similar manner to *Gomphus fraternus* and *G. externus* in parts where these occur.

Ophiogomphus rupinsulensis, Walsh.

Length: of abdomen ♂ 40, ♀ 38; of hind wing ♂ 30, ♀ 32 mm.

Bright yellowish green and pale brown. Face and occiput green, the latter slightly sinuous each side; cilia long and black, vertex blackish, vesicle straight, slightly swollen at the ends, antennæ black; thorax with a narrow pale antehumeral not reaching the shoulder, humeral complete and similar in width and color, sides uniformly yellowish-green, also the legs except the knees, inner surface of tibiæ and tarsi which are blackish; wings hyaline, costa green, veins black, pterostigma brown, covering four or five cells. Abdomen slender, 8-9 strongly dilated; brown with elongated yellow spots on dorsum of 1-10, conspicuous on 2 and 10, ears on 2 yellow, large yellow spots on sides of 7-9.

Abdominal appendages yellow; superiors longer than 10, stout hairy, obtuse, somewhat divaricate curving towards the mid-line, under surface with black tubercles; inferior not so wide, a little shorter, obliquely truncated; in profile strongly excavated before the apex, a stout process directed upward at outer angle of the truncation.

Female similar in color, but differing as follows: vertex lighter, humerals fainter and the dorsal spots

on abdomen less sharply defined. The abdomen is stout 8 and 9 somewhat expanded; the appendages are long, yellow, acute; the vulvar lamina nearly as long as 9, divided to the base, branches nearly cylindrical, pointed, apices bent outward and upward, clawlike.

It has not been taken later than June 20 in Central Ohio.

GOMPHUS, Leach.

This genus is well represented in our fauna; fourteen species have been taken and a few more are sure to be added in the future.

Baron De-Selys has arranged the species in groups defined as follows:

I Group, (Indian).

II Group. Front of thorax with six broad black bands; 7, 8 and 9 much dilated; membranule moderate. Anal appendages of the male black.

III Group. Front of the thorax yellow with six lines or bands, more or less broad; segments 7, 8 and 9 somewhat dilated; membranule very small; anal appendages black, superiors as long as 9, inferiors almost as long.

IV Group. Front of thorax olivaceous, with 4 or 6 lines or bands, brown, more or less distinct; segments 7 and 8 moderately expanded; anal appendages yellow or light brown, superiors as long as 10, inferiors nearly as long.

V Group. Front of thorax with an interrupted, mesothoracic semi-collar and two cuneiform spots (stripes) yellow; sides yellow with two black rays, confluent at two points; pterostigma short, black; face mostly black; anal appendages brown, superiors longer than the 10th segment.

VI. Group. Front of the thorax black with two antehumeral wide bands and a superior antehumeral

point yellow; sides yellow with a black, interrupted band; face yellow; anal appendages yellow, as long as 10.

VII. Pterostigma long; front indented, front of thorax brown with two isolated, narrow, straight lines, a vestige of a humeral and a mesothoracic semi-collar interrupted in the middle all yellowish green; abdomen long, slightly dilated posteriorly.

Our species are distributed in these groups as follows:

- II. *dilatatus* and *vastus*,
- III. *quadricolor*, *fraternus*, *externus* and *graslinellus*,
- IV. *villosipes*, *furcifer*, *exilis*, *lividus* and *spicatus*,
- VI. *spiniceps* and *plagiatus*,
- VII. *notatus*.

The species may be separated with little difficulty by the following characters.

II.

- 1. Large, male abdomen 50 mm; face yellow with two narrow transverse black bands.....*dilatatus*.
- 2. Medium, male abdomen 38 mm.; face yellow with two broad transverse black bands.....*vastus*.

III.

- 1. Dorsum of 9-10 black.....(1) and (2).
- 2. Dorsum of 9-10 with a yellow band.....(3) and (4).
- (1). Small, male abdomen 32 mm.; no yellow on dorsum of 8, *quadricolor*.
- (2). Medium, male abdomen 38 mm.; yellow triangle on dorsum of 8 (sometimes a faint yellow band on 9.....*fraternus*.
- (3). Medium, superior abdominal appendages of the male slender, obliquely truncated and excavated at apical fourth.....*externus*.
- (4). Medium, male superior appendages stouter, obliquely truncated with a prominent tooth at outer angle.....*graslinellus*.

IV.

- 1. Medium size, male abdomen 35 mm.; antehumeral stripes slightly divergent below.
- (1). Superior male appendages yellow, truncate with inwardly directed spine at the inner distal angle.

- (a). Male and female occiput with a spine in the middle.....*villosipes*.
- (b). Without the occipital spines.....*furcifer*.
- (2). Superior appendages brown, pointed, an acute tooth representing the outer distal angle.
- (a). From side view the male superior appendages have a strong, acute tooth near the middle of the inner, inferior edge, *spicatus*.
- (b). From side view the male superior appendages have obtuse prominence near the apex of the inner, inferior edge.....*lividus*.
- 2. Small, male abdomen 30 mm.; antehumeral more divergent below.
- (1). Face yellow, occiput straight.....*exilis*.

VI.

- 1. Large, black, 9 long.....*spiniceps*.
- 2. Large, brown, 9 slightly longer than 8.....*plagiatus*.

VII.

- 1. Large, brown and yellow.....*notatus*.

GROUP II.

Gomphus dilatatus, Rambur.

Length: of abdomen ♂ 50, ♀ 47; of hind wing ♂ 40, ♀ 40.

Male black and yellow; head yellow, the following black: borders of labrum and vertical line in the middle, a transverse line between clypeus and frons, the vertex antennæ; and the vertical vesicle is straight, occiput rather narrow, convex with a fringe of black cilia. The prothorax black, sides yellow with a large geminate spot centrally of the same: the thorax is yellow, black as follows: a mid-dorsal stripe with parallel sides, not reaching the front margin, an ante-humeral and humeral—both widely separated by a narrow yellow line and two lines on the side; legs black with coxae and under side of fore tibiae yellow; the wings are hyaline, costa yellow; pterostigma moderate covering five cells, yellow surrounded by heavy black veins. The abdomen is black, yellow as follows: sides of 1-2, dorsal band on 1-4, lanceolate apical spot on 5-7, large triangular apical spot on side of 8 and oblong one on side of 9.

The ears on 2 are yellow, edges black; joints 3-6 are slender, especially 3.

The appendages are black divaricate; the superiors as long as 10, slender, acuminate, apex obliquely truncate on outer distal fourth, there is a minute tubercle at beginning of the obliquity, in profile arched; the inferiors equally spreading nearly as long, up turned at the apex.

Female similar; vulvar scale elongate, of two lamellæ which are narrower towards the end and turned outwards.

This fine species has been taken only in the central part of the State in June. It is evidently rare. One male is known in which the triangles are all one crossed.

Gomphus vastus, Walsh.

Length of abdomen ♂ and ♀ 38; of hind wing ♂ and ♀ 23.

Male black marked with greenish yellow. Head with yellow, as follows: occiput, except the extreme edge, two spots at rear of eyes, frons in the middle, anterior half of postclypeus, labrum on either side, the genæ and the lateral lobes of the labium. The occiput is slightly concave. Prothorax black with yellow front edge, spot each side and in middle of posterior edge; thorax with yellow semicollar, upper half of carina, antehumerals, narrow humerals and sides, on the latter there is a black line in the front of the stigma and one at the second lateral suture. Legs and feet black with anterior femora yellow on the outside. Pterostigma brown covering four or five cells; costa green on extreme edge, the fore wings slightly flavescens on basal fourth. The abdomen is slender 7, 8 and 9 very much expanded laterally; shiny black with pale olive mid-dorsal interrupted band on 2-7; this is broad and halberd-shaped on 2, narrow and basal on 3-6, basal triangle on 7, the apical edge of 7 is bright

yellow, also a spot on basal edge each side of 8 and the whole lateral expansion of 9, the dorsum of 1 and the sides of 1 and 2 are light green.

The appendages are black, a little longer than 10; the superiors from above are divaricate, base broad, gradually narrowing with the apex obliquely truncated making the inner angle acute; in profile they are arched with a tooth at outer angle of the apical truncation, apex slightly turned upward. The inferiors reach the truncation of the superiors, a little more divaricate, apex turned up and obtuse.

The female differs in having a small black thorn either side of the vertical vesicle, the abdomen a little stouter, the mid-dorsal more distinct, 7, 8, and 9 not quite so much dilated and the spots at base of 8 faint. The appendages are cylindrical acuminate, black, longer than 10; the vulvar lamina longer than half of 9, bifid for one third its length, branches acuminate, approximated. This is an exceedingly common odonate along the shore of Lake Erie.

The females fly far out over the waves dipping the abdomen in the water as they fly to wash off the eggs. During June and early in July they may be found on any sunny shore of the lake or bays. They capolate at rest in trees and shrubs.

GROUP III.

Gomphus quadricolor, Walsh.

Length: of abdomen ♂ and ♀ 32 mm; of hind wing ♂ 26, ♀ 27 mm.

Male black and yellow. Face and occiput yellow; vertex black; vertical vesicle slightly excavated in the middle, occiput very convex. Prothorax black or dark brown with yellow spots on the sides and middle; dorsum of the thorax brown, mid-dorsal carinae in part yellow also a broad ante-humeral and a narrow humeral, sides yellow with two well marked oblique

bands narrow; coxae yellow, legs black with little pale on the inside of the femora; costa yellowish, pterostigma light brown covering three cells on fore wings. Abdomen slender, moderately expanded at 8 and 9, and four on hind wings black, yellow as follows: sides of 1 and 2 including the ear like appendages, expansion of 8 and 9, dorsal band from 1-8-broad on 1 and 2, narrow, lanceolate, apical, very small triangle on 8.

The superior appendages of the male are black, longer than 10, pointed with the apex directed outward; in profile there is a broad expansion downward with a backwardly directed tooth near outer third. The inferiors are nearly as long, more divaricate and turned upward at apex.

The female is stouter, occiput less strongly convex, vertex lighter, more pale or even olive on femora, dorsal band less pronounced, expansions on 8-9 slight not so bright yellow. The appendages are conical and black; the vulvar lamina is exceedingly short, emarginate, lobes round and thick; the posterior border of 8 is thickened and emarginate so there are four rounded bodies at this level.

This pretty species has been taken in Central Ohio late in May and as late as June 15. It rests on rocks projecting from rapids on the banks near by the most rapid parts of large streams.

Gomphus fraternus, Say.

Length of abdomen ♂ and ♀ 38; of hind wing ♂ 31, ♀ 32.

Male black and greenish yellow, Head; occiput yellow, strongly convex, fringed with black hairs, rear black, yellow at border of eyes, vertex and antennæ black, the whole face yellow, labium brownish. Prothorax black, bright yellow anterior edge, olive spot each side and two geminate ones in middle above. The thoracic carina is yellow with narrow black, parallel,

band each side not quite reaching the anterior border of mesothorax, a broad black antehumeral separated except at one point above from the narrower humeral by a yellow line; sides yellow with second lateral suture black and a band below reaching the mesothorac stigma a little above; wings with the costa green; pterostigma brown, covering three or three and a half cells; legs and feet black. The abdomen with well marked dorsal yellow band on 1-8, a broad space on 1, three lobed on 2, narrow, extending nearly the whole length of 3-6, on 7 half as long as ring, on 8 small triangle; the sides of 1-2 yellow, on the lateral expansions of 8 a large bright yellow spot separated from an apical one by irregular brown shade, and all of the sides of 9.

The appendages are blackish, longer than 10, from above divaricate, base broad, tapering, apex acuminate, in profile arched, apex obliquely truncated upward; inferiors more spreading, reaching beyond the lower angle of the truncation which is slightly prolonged, apex turned upward, obtuse.

The female differs in having the occiput concave with an obtuse process in the middle, the humeral and ante-humeral connected for a wider space, a yellow stripe on outer side of first femur and sometimes on third; the abdomen is stouter, and the expansion of the apex not so broad. The appendages black and pointed; the lamina reaches the middle of 9, bifid in apical third, branches turned outwards at apex.

Fraternus is common in most parts, in May, June, and first days of July; it is only found by the shore of the great water or by considerable streams, then about the most rapid reaches. The females oviposit by washing the eggs into the rapids or the breaking waves.

Gomphus externus, Selys.

Length: of abdomen, ♂ 40, ♀ 40; of hind wing ♂ 34, ♀ 35.

Male black and greenish yellow. Head; occiput not at all or slightly convex, yellow fringed with black hairs, rear black with a stripe proceeding downward from the occiput and outer border yellow, vertex black with a small spot on each side below the occiput yellowish green, antennæ black, whole face yellow, margins of mouth brownish.

Prothorax black, anterior border bright yellow, above with a spot each side and a geminate spot between, yellowish. Thoracic carina yellow with a black band each side, interrupted anteriorly, a broad, black antehumeral separated below from the humeral by yellow, first and second lateral sutures and an abbreviated line between them reaching nearly to the metastigma black, remainder of thorax greenish yellow; costa green, pterostigma brown covering about four cells, legs black with the exception of the anterior femora each of which have a greenish yellow vitta on the inner side. Dorsal band of abdomen yellow as follows, a patch broadest behind on 1, broad and three lobed on 2, broad at base, gradually narrowed but not reaching the apex on 3-6, a triangular basal on 7 and 8, reaching the whole length of the segment on 9; laterally sides of 1 and 2 and part of 3, partially obscured spots on base of 4-7; a basal and a small apical spot on 8, whole length of 9, yellowish. Appendages longer than 10, from above divaricate, tapering gradually from base, outer distal angle obtuse, inner distal angle acuminate, apex obliquely truncate, from side arched; inferiors nearly as long as the superiors, apex turned upwards.

The appendages of this form are very much like those of *fraternus*, but the superiors have a more prominent outer distal angle and the inner distal angle is not so strongly produced.

The female has the occiput straight, not "rising in the middle in two confluent curves" (Walsh), nor is

"the space between the lateral thoracic lines livid," but of the more usual greenish yellow hue ; the vertical thorns are black and conical ; the posterior femora are either with or without external vittæ, in this regard agreeing with the female of *fraternus*. It has been said that the latter has no vertical thorns, and that the females of *externus* and *fraternus* may thus be separated ; this will not do, for the female *fraternus* has long slender, black or yellow vertical thorns ; they are easily separated, however, by the difference in the occiput—*fraternus* with a spine in the middle of the border, *externus* having the same straight or slightly concave—*externus* is larger and the vitta ♀ is almost as conspicuous as in *externus*.

Easily separated from *fraternus* by the wide yellow vitta on the ninth abdominal segment, its larger size and straight or concave occiput.

Common along the Olentangy river at Delaware and Columbus in June.

Gomphus graslinellus, Walsh.

Length of abdomen ♂ and ♀ 39, of hind wing ♂ 33, ♀ 34.

Male black, yellow and greenish yellow. Head; occiput yellow, slightly convex, fringed with short, black hairs, rear yellow with the upper parts of the orbits brownish or black, vertex and antennæ black. Prothorax black with a bright yellow spot on the anterior border, base with a spot each side and one between them yellowish ; thoracic carina brown with a similar colored space each side, humeral and antehumeral bands present, separated for their whole length by a narrow yellow stripe, first and second lateral sutures margined with brown ; wings with the costæ greenish yellow ; legs, femora and tarsi black, tibiæ black with a yellow dorsal band as follows : a rather wide, uniform band on 1 and 2, a narrower,

tapering patch on 3-6 in no case reaching the apex, a triangular, basal patch on 7 and 8, a wide vitta widening gradually as it approaches the apex on 9 and an elongate spot on 10; laterally segments 1, 2 and base of 3 are greenish yellow, 4-7 have obscure basal patches, and 8 and 9 have the lower border wholly bright yellow. Superior appendages brown, from above divaricate, sides nearly parallel, outer distal angle nearly a right angle, inner distal angle produced into an oblique acuminate process, apex slightly concave; inferior appendage nearly as long as the superior, spreading, curved upward and inward at the tip.

The female is stronger, abdominal segments 8 and 9 are not so strongly dilated, the front femora are yellowish vittate below and the occiput is concave with a prominence in the middle; appendages pointed, dark, the lamina is short.

Separated from *fraternus* by the wide vitta on 9, and from *externus* as well as *fraternus* by the greenish yellow stripe on the superior side of all the tibiae.

The species flies in central Ohio during June and the first part of July. Four pairs taken in this locality are in the University collection.

GROUP IV.

Gomphus villosipes, Selys.

Length of abdomen ♂ 38, ♀ 39; of hind wing ♂ 31, ♀ 33.

The color is black, olive, yellow, and brown. In the male the rear of the eyes is yellow below, black above; occiput yellow, extreme edge black, cilia black; convex, stout, black, spine in the center; vertex black, end of the vesicle yellow; whole front and lips yellow. Prothorax black, yellow spot on sides and double one in middle of second lobes, yellow spot in middle of third

lobe. Thorax light olive, black, marked as follows; stripe each side the carina not forming a collar, an antehumeral and humeral well separated, a line in front of the stigma and the upper part of the second suture; the legs are black yellow as follows; inside of femora of first pair, narrow stripe on external side of tibiæ of all pairs; wings with costa olive, pterostigma yellow. The abdomen is black with olive dorsal band on 1-7, 8 and 9 all brown lighter on the sides, moderately dilated, sides of 1-7 more or less olive, 9 yellow including the appendages,

The superior appendages are as long as 10, divaricate wide at base, tapering, outer apical angle rounded, inner produced into a long, black tipped spine set obliquely inward; in profile greatly curved, apical third directed obliquely upward. Inferiors with spreading apexes blackish, curved up at apex.

Female differs in being stouter and a little larger and in having more yellow on the sides of the abdomen. In one specimen the spine on the occiput is quadridentate above, the same organ in some males shows two similar teeth, while in others it is simply acuminate. The vulvar lamina is triangular, one third as long as 9 with the apex two parted, contiguous.

The species is on the wing at Columbus during the latter half of May and the first part of June.

Gomphus fuscifer, Hagen.

Length : of abdomen ♂ and ♀ 36, hind wing 30.

Colors black, olive, brown and yellow. Male, occiput very slightly convex, olive and fringed with black hairs, rear of head yellow below, black above, whole face olive, mandibles and vertex black. Prothorax with an irregular, yellow spot near the front margin, posterior to this a lateral spot each side and two geminate spots on the vertex olive; mesothoracic carina olive bounded each side by brown which in some

specimens is obscure ; a humeral and an antehumeral present, usually united above ; first and second lateral sutures obscurely margined with brown. Dorsal line on abdomen present on 1-7, 10 nearly all yellow. Appendages yellow, spreading, shorter than 10, sides nearly parallel, outer distal angle prominent, tipped with a black denticle, inner angle produced into an oblique horn-like process, apex truncate, inferiors longer than the superiors, strongly divaricate, yellow, turned upward and black at tip.

The female has the vulvar scale short, triangular divided at the apex with the ends rounded.

Readily separated from *villosipes* by the male appendages, and by the absence of the spine on the occiput.

Taken at Licking Reservoir, June 14, and at Kent, June 21. Does not seem to be common.

Gomphus exilis, Selys.

Length : of abdomen ♂ 30, ♀ 32 ; hind wing ♂ 24, ♀ 26.

Colors black, olive, yellow and brown. Male occiput yellow or olive, straight and ciliate above, rear of head brown or brownish, front margin of prothorax yellow, posteriorly with an olive spot each side and a geminate one of the same color between them ; brown each side of the thoracic carina, humeral and antehumeral bands present, more or less obscurely separated by olive, space between first and second lateral sutures brown, legs brown or black, all the tibiae vittate with olive above, feet black ; wings, costa greenish, pterostigma brown. Abdomen black, yellow dorsal band present on segments 1-9, segments 8 and 9 with ventral edges yellow, 10 wholly brown or with a small yellow marking dorsally.

Superior appendages as long as 10, divaricate conical, acute at apex, from side view a triangular process

may be seen on the under side ; inferiors shorter than superiors, divaricate and turned up at tip from side view.

The female differs in having the tenth segment wholly yellow, the legs, front pair femora yellow below and blackish above, middle femora the same, hind femora yellow except at apex, the coxae and trochanters of all the legs yellow. Vulvar lamina short, not more than a fifth as long as 9, triangular, divided, the two lobes separated with their apexes rounded.

This species is common in all parts of the state in the latter part of May, June, and fore part of July. It has been taken at Columbus as early as May 9th. Canals and ponds are its favorite resorts.

Gomphus lividus, Selys.

Length of abdomen ♂ 34-36, ♀ 36, hind wing ♂ 30-32, ♀ 34.

Colors fuscous, olive and yellow. Male, occiput convex, ciliated with black hairs, face yellow, vertex and antennæ fuscous, rear of head olive, largely overlaid with brown. Prothorax fuscous, front border, a posterior, geminate spot and a spot each side olive ; thoracic carina fuscous narrowly margined each side with the same color, humeral and antehumeral bands fuscous obscurely divided for part of their extent by olive, space between the first and second lateral sutures fuscous, as is an oblique band on the posterior margin of the thorax ; legs fuscous with the superior side of all the tibiæ and hind metatarsi marked with olive ; wings, costa olive, pterostigma yellowish brown. Abdomen, dorsal band present on 1-9, this band is abbreviated on 5-8, on 9 it is wide and continuous ; sides of 1-2 and 8-9 olive below, basal spot on 3-7 ; superior appendages brown, nearly one and a half times as long as 10, divaricate, widest at base, gradually tapering, outer distal angle has the appear-

ance of a small denticle, inner distal angle strongly concave; from side view an inferior prominence occupies the outer third. Inferiors more spreading than the superiors, of nearly the same length, and, from side view turned upward at the tip.

The female has the occiput straight, and the legs more olive than those of the male. This species may be easily separated from *villosipes* and *furcifer* by its fuscous instead of black color; and by the superior appendages of the male, which instead of the inner distal angle being produced into a process which points obliquely inward, as in those species, the prominence of this angle takes the general direction of the body of appendage. From *exilis* it may be readily separated by its color and larger size.

Gomphus spicatus, Selys.

Length of abdomen ♂ 35, ♀ 35, hind wing ♀ 27, ♂ 30.

Colors olive, brown and fuscous. Male; occiput olive, regularly convex, ciliated with black hairs on the superior margin: prothorax fuscous with the usual lighter markings. Mid-dorsal carina margined, each side with brown; humeral and antehumeral bands present, brown, obscurely separated by olive for at least part of their extent, space between the first and second lateral sutures brown, none of the brown markings on the thorax are as conspicuous as in the foregoing species of this group. Legs fuscous, all the tibiae vittate with olive above; wings, costa yellow; pterostigma brown, covering four cells and part of a fifth. Abdomen, dorsal band present, segments 8-9 yellow on the inferior edge of the lateral surface. Superior appendages divaricate, as long as 10, wedge shaped with an acute projection near the middle of the outer border, apex acuminate. From side view, near the middle of

the inner margin is a prominent acute projection. Inferiors more spreading than the superiors, from side view gradually curved from base to apex. The female differs in having the occiput suddenly prominent in the middle and front femora wholly olive and hind femora olive with apex fuscous. The vulvar lamina is about one fourth as long as 9, divided lengthwise, the tips separated; so that it has the appearance of being composed of two wedge-shaped parts with acute apices.

The slight contrast in the colors of the thorax, and the acute spine on the under side of the middle of the inner edge of the superior appendage of the male, are characteristics of this species.

Spicatus frequents the borders of wave beaten shores or rushing rivers; the males, during the warm sunny hours, make frequent excursions over the crested waves, after each of which they return to shore for rest, the females generally remain in the herbage or higher on trees near by, flying out occasionally to deposit their eggs in the disturbed waters and often bringing back a consort to the place of rest.

A common species in parts of Northern Ohio in June.

GROUP VI.

Gomphus spiniceps, Walsh.

Length of abdomen ♂ 48, ♀ 47, hind wing ♂ 36, ♀ 39.

Male; colors black, olive and yellow; head black with an olive band on the post-frons. On the vertex there is a U-shaped elevation, the upper angles of which are tooth-like, and between this and the eye on either side there is a small yellowish spine; occiput nearly straight, olivaceous above. Thorax and dorsum black with brownish reflection, mesothoracic

collar, a short, broad stripe each side and antehumeral ray, spatulate above, olive; sides paler, with an olivaceous stripe beneath each wing, olivaceous below; wings hyaline, veins and costa black, pterostigma reddish brown, 5 millim. long; membranule very narrow, whitish; legs black. Abdomen black, 8 and 9 strongly dilated, 9 almost as long as 8+10; 1, 2, 8 and 9 olivaceous on the sides, 1-8 with dorsal yellow spots as follows: 1, apical, triangular; 2, lanceolate, nearly the entire length; 3, 4, 5 and 6, basal, oblong; 7 and 8, basal, triangular; appendages black, divaricate, superiors longer than 10, acute, depressed, slightly turned up at apex and having eight or ten minute crenulations on the lower, outer edge apically, inferiors not quite so long, hamulate at apex.

The female differs in the abdomen being much stouter, 8 and 9 not dilated and in the possession of a small notch in the middle of the occiput. The vulvar lamina is very short and rounded at the apex.

The species has been taken at Sugar Grove and Akron in September. Four specimens were captured and many more seen at Sugar Grove, September 4th, 1894. They were observed flying late in the afternoon, and ovipositing in a small brook that was rippling over pebbles. They continued to fly until it was so dark that the eye could not follow them. Pairs at rest; the female oviposits in a manner similar to that of the *Libellulas*.

Gomphus plagiatus, Selys.

NOTE—Regarding the identity of Ohio specimens which I believe to be *plagiatus*, at the present time, there is some doubt. This species and *notatus* are apparently very close. Dr. Calvert has kindly sent me specimens of *plagiatus* taken in Texas. A dozen specimens taken at Sandusky June 20, '96 and referred to by Prof. Kellicott in Jour. Cin. Soc. Nat. Hist. XIX,

66 as *notatus* agree with the above mentioned specimens of *plagiatus*. Mr. C. C. Adams who has studied the specimens of both species in the museum of Comparative Zoology recently states that the female of *plagiatus* has the vulvar lamina emarginated in the middle while the same is rounded in *notatus*. The Sandusky females agree with *plagiatus* in this regard.

Because of the doubt existing in my mind, I give Dr. Calvert's description of *plagiatus* in full below.

Olive green. Brown predominating on thoracic dorsum so as to leave a narrow antehumeral stripe, notably divergent from above downwards from its fellow of the opposite side, and the mid dorsal carina yellow (teneral) or green; sides pale, a line in front of the metastigma and on the second lateral suture, brown. Abdomen long, 1-6 brown with a pale green mid-dorsal spot or stripe, 7-10 yellowish.

Male: Hind margin of occiput slightly convex, Superior appendages with teeth, apex obliquely truncated (when viewed from above), the acuter angle on the inner side, usually no tubercle at the outer (obtuse) angle. Inferior appendages one-fourth shorter.

Female. Hind margin of occiput straight. Vulvar lamina very short, less than one-tenth of 9, emarginated in the middle, tips on either side of emargination acute.

Length of abdomen ♂ 40-45, ♀ 44-49; hind wing ♂ 32-35, ♀ 35.5-37.

Mr. C. C. Adams makes the statement that the females of *plagiatus* and *notatus* may be separated by the vulvar laminæ. This is emarginated in the middle in *plagiatus* and rounded in *notatus*.

One female specimen taken at Wauseon July 1, 1896, I am of the opinion belongs here. It measures as follows:

Length of abdomen 42, of hind wing 38 millimeters.

GROUP VII.

Gomphus notatus, Ramb.

Dr Calvert states that *Gomphus notatus* seems to differ from *plagiatus* according to specimens in the Museum of Comparative Zoology by its smaller size, slightly concave occiput (slightly convex in *plagiatus*) 8th segment of the abdomen dark brown with a mid-dorsal yellow triangular spot, (this segment pale brown in *plagiatus*) and no well marked external ante-apical angle on superior appendages as exists in *plagiatus*.

DROMOGOMPHUS, Selys.

Two species of this genus have been taken in the State; *spinosus* is common in all parts, *spoliatus* is abundant in the Maumee Valley. The species when flying usually follow close to the banks of quiet streams and canals, and are not so fond of rippling water as are many species of the genus *Gomphus*.

The two species may be separated as follows :

1. Abdominal segments 7-10 almost entirely yellow, the distal part of hind femora black.....*spoliatus*.
2. Abdominal segments 7-10 almost entirely black. hind femora all black.....*spinosus*.

Dromogomphus spinosus, Selys.

Length : of abdomen ♂ 41 ♀ 42, hind wing ♂ 35, ♀ 37.

Male; colors black, brown, olive and yellow. Head; occiput olive, regularly convex, ciliated; front olive with sutures margined with black; vertex and mandibles black: Prothorax black, yellow dorsally; mid-dorsal carina olive, a fine band each side uniting above and below with the antehumeral, a broad humeral and an antehumeral united above and below, brown, remainder of thorax olive; legs and feet black, front

tibiæ vittate with olive beneath. Abdomen; dorsal band present on all the segments, sides of 1-2 and base of 3 olive, sides of 7-10 more or less marked with yellow, superior appendages black, from above wedge-shaped, acuminate at tip; from side view, tips slightly elevated, inferior appendages from above slightly more spreading than the superiors, gradually curved, from side view four fifths as long as the superiors, gradually curved, apex blunt.

The female differs in the stouter form of the abdomen, in the occiput being concave in the middle where it bears an angular tooth, and in the humerals and antehumerals being separated above.

The vulvar lamina is about a third as long as 9, triangular in general outline and divided at the apex with the two parts divaricate, pointed.

The species is distributed all over the State.

The female has been observed often ovipositing in a manner similar to *Maccromia illinoisensis*, that is by skimming the water and every few feet or rods touching it with the abdominal tip, scarcely checking her speed; at other times I have seen them drop down from an overhanging tree and repeatedly tap the water, remaining in one place after the manner of *Libellula*. Pairs were noticed to fly up into tree tops and remain in union for a considerable time.

Dromogomphus spoliatus, Selys.

Length of abdomen ♂ 45, ♀ 47, hind wing ♂ 36, ♀ 39.

Male; colors brown, yellow and black. Head; occiput yellow, convex, ciliated with light colored hair, face yellow, vertex brown; prothorax yellow irregularly marked with brown, mid-dorsal carina yellow, margined each side with brown which gradually widens anteriorly, humeral and antehumeral bands present, separated; first and second lateral sutures and

more or less of the space between them brown, remainder of the thorax and all the coxae yellow; legs and feet, all the tibiae and tarsi, front femora except an inferior, yellow vitta on each, middle femora and distal part of hind femora, black; the hind femora have dark lines laterally and superiorly for their whole length; costa yellowish, pterostigma light brown covering four cells. Abdomen; dorsal line present on 1-6, sides of 1-3, basal, transverse band on 4-6, all of segments 7-10, yellow; segments 7-10 are often largely suffused with brown above and the extreme ventral edge is always brown in fully matured specimens. Superior appendages yellow, in form resembling those of *spinosus*; inferiors from above gradually divaricate, more spreading than the superiors, wide at base and gradually narrowed; from side view yellow at base, black distally, shorter than the superiors, suddenly turned up at apex and produced above into an acute projection.

The female differs in its larger size and stouter abdomen and in the occiput being rather suddenly prominent at the middle. This prominence does not form a spine as in *spinosus* but simply an obtuse angle. The vulvar lamina is nearly a third as long as 9, triangular in general outline, the apex is divided; the two parts divaricate, acuminate, and turned outward at the tips.

The species is common in north western Ohio along the Maumee River and its tributaries, and the Ohio Canal. I have never seen this species fly up into trees during copulation as is stated regarding *spinosus*. Both male and female fly along the bank with a swift, regular flight, coming to rest on bare spots close to the water where copulation takes place. The female oviposits similar to *Libellula*. The queer thing about this gomphid is that females are as often taken as males.

FOURTH SUB-FAMILY.

CORDULEGASTERINÆ.

The members of this sub-family are all large insects. Less than ten species have been described from America north of Mexico. None of these seem to be common, so far as individuals are concerned, at least they are not often taken. I have seen so few specimens on the wing that I do not feel justified in giving anything of their habits in the field.

CORDULEGASTER, Leach.

Two species have been taken in the state ; they may be separated as follows :

1. Large species, abdominal segments 2-7 nearly encircled by yellow,
erroneous.
2. Smaller species, yellow on abdomen takes the form of spear-shaped markings on the dorsum of segments 2-8.....*obliquus.*

Cordulegaster erroneus, Hagen.

Length of abdomen ♂ 53-56, ♀ 62, hind wing ♂ 44-47, ♀ 50.

Female; colors black, brown and yellow. Head; anterior part of vertex, nasus, genæ, disk of labrum, and labium, yellow ; occiput yellow behind, brownish yellow in front, ciliated above with long yellowish hairs; remainder brown. Thorax; in front two oblique bands pointed below and abbreviated at both ends, on each side two oblique bands abbreviated at the ends, and a spot above between them, the posterior ventral surface and a spot between each pair of wings yellow. remainder black ; legs and feet black ; veins of wings and pterostigma black. Abdomen, a ventral and a lateral spot each side on 1, a transverse median band, oblique on the sides and continued by the ventral spots on 1, and a ventral and lateral spot distally

each side on 2; a median band and a small lateral spot distally on 3; a median band on 4-7 obscurely abbreviated above; and a triangular lateral spot each side on 8 yellow; remainder black. Vulvar lamina three times as long as 9, eight millimeters, wide at base, gradually narrowed with apex rounded, divided except at base, the two parts contiguous; appendages short, black, apex angular.

The male is colored similar to the female: superior appendages short, not as long as 10; two small interior teeth. Inferior appendages three-fourths as long as the superiors.

The female was taken, while resting above a cold spring on a hillside at Sugar Grove, July 5, 1891.

Cordulegaster obliquus, Say.

Length: of abdomen ♂ 52, ♀ 58, hindwing ♂ 44, ♀ 48.

Male; colors black, yellow and brown. Head; rhinarium, mandibles and posterior part of vertex black, eyes brown, remainder yellowish. Thorax; an antehumeral band widest above and abbreviated at both ends, two lateral bands with a row of more or less obscured spots, posterior part of venter, and a spot between each pair of wings yellow, remainder brownish-black. Legs and feet black. Costa yellow in front, veins and pterostigma black. Abdomen; a ventral spot each side on 1, a dorsal band and two lateral spots on 2, a dorsal and a ventral band on 3, dorsal bands in the form of spear-shaped spots on 4-8, yellow, remainder black. Superior appendages from above about three fourths as long as 10, slightly divaricate, sides nearly parallel, abruptly pointed at the apex; from side view straight, cut obliquely upwards at apex which is pointed and slightly elevated. Inferior appendages from side view about two thirds as long as

the superiors, straight, prominent at the outer distal angle and bearing a forward curving tooth.

The female is colored similar to the male.

Taken at Orwell, Ashtabula County, June 1895.

FIFTH SUB-FAMILY.

ÆSCHNINÆ.

The members of this sub-family found in Ohio are medium sized to very large insects. It includes some of the most hardy forms, being the first to appear on the wing in spring and the last to disappear in the fall. The eyes are contiguous for nearly their entire width in both sexes, wings are long and broad and the anal angles of the hind pair are rounded in the female and prominent in the male (except *Anax*). As a usual thing they do not spend so much time flying over the water as some of the preceding forms. They are common about fields and sunny places in woodlands, and are continually busy catching flies and other small insects for food.

The female is attended by the male much of the time and it is a common thing to see pairs take long excursions over the water, flying three or four feet above its surface. The female seems to prefer to oviposit in stagnant pools and ponds where the surface is covered by duck weed and other aquatic plants.

The genera may be separated as follows ;

1. Triangle once crossed..... *Gomphæschna*
Triangle with more than one transversal.....2
2. Subnodal sector furcate in the hind wings.....3
Subnodal sector not furcate in the hind wings.....5
3. Anal angle of male rounded, thorax uniform green..... *Anax*
Anal angle of hind wing of male acute, thorax brown, banded
with green.....4

4. Expanse more than 110 millim., abdomen of male and female not strongly constricted at three.....*Epiæschna*
Expanse less than 100 millim., abdomen strongly constricted at three.....*Æschna*
5. Fore wing broadest at the nodus, two lemon yellow spots laterally on thorax.....*Fonscolombia*
Fore wing broadest at nodus, two whitish bands laterally on thorax *Basiaeschna*

ANAX, Leach.

This genus differs from all other members of the *Æschninae* in the male having the anal angles of the hind wings rounded. The species are very large and their flight is strong. *A. junius* is an exceedingly abundant form in all parts of the state. *A. longipes* has never been taken in Ohio, but Mr. Charles Dury is confident he identified the species on the wing at Cincinnati in May 1898.

The following table will serve to separate these two species :

1. Front above with a fuscous spot surrounded by green and the whole by blue.....*junius*.
2. No markings on front above.....*longipes*.

Anax junius, Drury.

Length: of abdomen ♂ 53-57 ♀ 53, hind wing ♂ 50-52, ♀ 54.

Colors ; male, green, blue and fuscous.

Head; front green, a black spot above surrounded by green, then by fuscous; mandibles black, other mouth parts green; eyes fuscous occiput greenish in the middle; rear of eyes, superior margin and middle fuscous, lateral parts green

Thorax green; femora brown, tibiæ and tarsi black; wings hyaline, costa yellow, other veins fuscous or brown; pterostigma yellow, membranule large, white anteriorly, fuscous posteriorly. The base of the abdomen corresponds in color to the thorax, blue begins at the anterior third of the second segment and is more or less apparent on several segments, but

fuscous predominates, The colors are so changed in dry specimens that it is difficult to define their exact outlines. Male superior appendages as long as 9+10. From above gradually widening from base; inner border suddenly excavated near the apex; an acute spine at outer distal angle; a median, longitudinal thickening traverses the whole length of each appendage. Inferior appendage short about one sixth as long as the superiors, distal end truncate.

The female differs in having the occiput twice tuberculate posteriorly, and in not having so strong a constriction at abdominal segment three. The appendages are as long as 9+10, foliate, pointed at apex.

This species has been taken at Columbus as early as March 21st, and has been observed on the wing during the first days of November. It oviposits usually while attended by the male. The pair may be seen flying over stagnant water where sedges and the like abound; at intervals they drop down and alight on some object near the water's surface; soon the female may be seen with her abdomen beneath the surface of the water depositing her eggs. Nymphs of various sizes may be secured from ponds and ditches at most any time of year.

Anax longipes, Hagen.

Length of abdomen ♂ 55-58, ♀ 52-60, hind wing ♂ 51-53 ♀ 49-56.

The following from Hagen's description, *Psyche* 1890, Vol V, 303, will enable the student to identify the species:

Male, eyes dark reddish brown, head, thorax and base of abdomen green; abdomen brick red; front green, without any spot above; vertex, antennæ and occiput black; eyes behind with a very large, elongated green spot; legs black, femora yellow. Wings hyaline, venation black, costa yellow, pterostigma narrow, yellow.

Female, head, thorax, legs and the two basal segments green; eyes blue, the hind margin of the occiput on each side yellow; second segment with a transversal brownish median stripe on each side; abdomen from the third segment brown.

Hagen's description was taken from living specimens.

GOMPHAESCHNA, Selys.

The insects of this genus have been taken in the State only at Columbus. Either they are not common or we have not learned how to procure them, for but few specimens have been taken or even seen.

Gomphaeschna fuscillata, Say.

Length : of abdomen ♂ 44, ♀ 41; hind wing ♂ ♀ 36.

Male, color black and brown. Head, eyes brown, front brownish the posterior extremities in the form of a band grayish, disk marked with yellowish; antennæ yellow; behind the eyes black.

Thorax brown, a narrow humeral band and two lateral bands black; the first lateral band is abbreviated above, the posterior one is narrow and reaches to the base of the hind wing; between the inferior portions of the humeral stripes there are two yellow markings resembling marks of parenthesis. Femora brown, tibiæ and tarsi black; wings; costa yellow, pterostigma and veins brown. Abdomen black, the apex of each segment and ventral markings obscure brownish. Superior appendages as long as 9+10 inferior edge abruptly widened at basal fourth, both edges gradually widening from thence to apex, a longitudinal thickening at middle, apex rounded, inferior appendages two fifths as long as the superiors; the distal third divided, with the branches divaricate.

The colors of living specimens are very much brighter than in dry specimens. Thus what I have called brown or yellow is really greenish originally.

Taken at Columbus June 13.

This species differs from any other species of the sub-family in our fauna in the form of the abdomen. The widening again after the constriction at three is not present, but a very gradual narrowing continues from thence to apex.

FONSCOLOMBIA, Selys.

The single representative of this genus is quite common in Ohio. It flies along streams where fallen trees and drift-wood abound. Its glossy wings correspond so closely to the water that it is seen with difficulty. The female has been observed resting on the trunks and branches of trees and shrubs, sometimes twenty feet or more above the ground. This is one of the species which the collector is not likely to procure until he understands its habits. After that he considers it a common form.

Fonscolombia vinosa, Say.

Length of abdomen ♂ 50 ♀ 50. hind wing ♂ 42 ♀ 44.

Male; color reddish brown, darker in fully matured specimens. Two conspicuous yellow spots on each side of thorax; wings slightly brown at base, veins reddish, pterostigma yellow. Abdomen; mid-dorsal carina present on 2-8, auricles on 2 yellow, two or three small yellow spots usually present on sides of 4-8; superior appendages as long as 9+10, widest beyond the middle, narrowed from thence towards apex which is bluntly angular, a longitudinal, median thickening present.

Inferior appendages one third as long, yellow, conical, notched and brown at apex.

The female has the hind wing wider and the anal angle rounded.

Taken in all sections of Ohio in August and September.

BASIÆSCHNA, Selys.

The single species of this genus is abundant at times, while some seasons pass without its being observed at all. It is on the wing early, specimens having been procured at Columbus as early as the middle of April.

Basiaeschna janata, Say.

Length: of abdomen ♂ ♀ 43, hind wing ♂ ♀ 36.

Colors; brown and fuscous. Male; front greenish, above yellow or greenish, with a median, longitudinal, impressed, black marking; occiput and rear of eyes largely yellowish. Thorax, mid-dorsal carina fuscous bordered each side by greenish; two greenish yellow bands edged with fuscous on each side; wings clouded at base, veins brown, pterostigma yellow, membranule white. Abdomen constricted at 3, superior appendages as long as 9+10, narrow at base, very gradually widening to beyond the middle. Here there is a bend and the general direction is directly backward, instead of obliquely downward and backwards as before. The apical third is flattened. Inferior appendages conical, one half as long as the superiors.

The female appendages are shorter, straight, and anal angle of hind wing rounded.

EPIÆSCHNA, Selys.

Like the two preceeding genera this one contains only a single species. It is the bulkiest dragonfly of our fauna. *Macromia taeniolata* approaches it in expanse but not in size of body. This species differs from other species of the sub-family in the less obvious constriction at abdominal segment three.

Epiæschna heros, Fab.

Length: of abdomen ♂ 65 ♀ 67, hind wing ♂ 55 ♀ 60.

Male; colors brown and green. Front green darker approaching brown above, margin of mouth brown. Thorax brown, an antehumeral band and two lateral bands with a spot between their superior ends, green. Wings yellowish, veins and pterostigma brown; legs; femora brown at base, black at apex, tibiae and tarsi black. Abdomen brown marked with bright green which becomes obscure in dry specimens; 10 with a mid-dorsal tooth.

Superior appendages, basal third narrow, remainder widened, median longitudinal carina present, inferior edge hairy. Inferior appendage one half as long as superiors, oblong, notched at apex.

The female lacks the spine on the dorsum of 10, but has a spined projection ventrally on that segment. She also has the rear of the eyes elevated so that a prominent projection is formed each side of the occiput.

The species flies during early summer. When on the wing it is continually catching insects, great number, of which are required to satisfy its voracious appetite. It is one of the few dragonflies that often enter buildings.

ÆSCHNA, Fabricius.

The species of this genus fly very commonly from August until the end of warm weather in the fall. In protected places along the edge of woods, one may find all of our Ohio forms flying together most any time in September. The different species are so much alike that one can not with certainty recognize them on the wing. Like the other members of this sub-family they take long excursions over sunny fields in search of flies and other insects for food. The three species of the genus taken in Ohio may be separated as follows:

1. Male, anal triangle of hind wing with three cells; a prominent spine at inferior distal angle of superior appendages. Female, genital valve strongly elevated at apex, vulvular process long, 2 millim.....*constricta*.

2. Male, anal triangle with two cells; superior appendages with longitudinal carina not denticulated. Female, genital valve not strongly elevated at apex, vulvular process short.....*verticalis*.
3. Male, anal triangle of two cells; longitudinal carina of superior appendages with apical third denticulated.....*clepsydra*.*

*We have not succeeded in identifying the female of this species.

Æschna constricta, Say.

Length of abdomen ♂ 52-58, ♀ 53-55, hind wing ♂ 43-46 ♀ 45.

Colors fuscous, brown and green. Male; front green, with a T-shaped black spot above; occiput yellow, lateral projections black; back of eyes black. Thorax brown with an antehumeral and two lateral bands green, also green between each pair of wings, femora brown above fuscous beneath, tibiæ and tarsi black; wings, pterostigma fuscous, membranule white anteriorly, dark posteriorly, anal angle of hind wings three celled. Abdomen fuscous, banded and spotted with green, strongly constricted at 3; superior appendages as long as 9+10, inferior margin prominent, hairy, and thickened to form an inward projecting tubercle posteriorly; base narrow, inferior distal angle produced into a prominent spine. Inferior appendages one half as long as the superiors, concave above, conical, blunt and obscurely notched at apex.

Female, wings yellowish, especially in o'd specimens, appendages foliate, mucronate at tips, narrow at base, length 7 millimeters; genital valve slightly longer than 9, with a lateral emargination; apex elevated truncate; vulvular process 2 millimeters long and tipped with a bundle of hairs. Description of female taken from three specimens taken in copulation.

This is our commonest *Æschna* and is taken in all parts of the state.

Æschna verticalis, Hagen.

Length of abdomen, 50-53 ♀ 53, hind wing ♂ 44-47 ♀ 45.

Colors brown, fuscous and green. Male; markings on thorax and abdomen are variable in different specimens. There are only two cells in the anal triangle of hind wings which at once separates it from *constricta*. Superior appendages as long as 9+10, narrow at base, superior longitudinal carina not denticulated, apex with a short thorn directed obliquely downward. Inferior appendage one half as long, conical, angular at apex.

Female of the same form as the male, appendages narrow at base, oblong, rounded at apex, obscurely mucronate. Genital valve as long as 9 with a lateral emargination; apex not strongly elevated. Vulvular process short, not over one millimeter. The appendages only a little more than half as wide as in *constricta*. This description was taken from a female taken in copulation. When more material is procured it may be necessary to verify some statements.

This species flies with *constricta* but is not nearly so common.

Æschna clepsydra, Say.

Length of abdomen, ♂ 51 ♀ 50, hind wing ♂ 44, ♀ 43.

Colors brown, fuscous and green. Head, front green, nasus and rhinarium fuscous or brownish in some specimens. Mandibles and margins of mouth fuscous, a fuscous T spot above; occiput yellow in the middle, remainder fuscous; rear of eyes fuscous. Thorax brown, an antehumeral stripe and two lateral stripes green, also green between the wings above; femora and tibiæ brown above, fuscous beneath, tarsi fuscous; wings and pterostigma fuscous above, yellowish beneath, costa yellowish, other veins fuscous; anal triangle of two cells, membranule small.

Abdomen constricted at 3, fuscous marked with green; mid-dorsal carina present; appendages as long

as 9+10, narrow at base, inferior edge widened at basal third, width nearly uniform from thence to near the apex; longitudinal carina present, denticulated on posterior third; apex rounded and furnished with a spine which points obliquely downward.

SIXTH SUB-FAMILY.

CORDULINÆ.

The members of this sub-family are medium sized to large species, and unlike those of the preceding, are seldom seen except in the vicinity of water.

All I have seen ovipositing fly leisurely near the bank and strike the water from time to time with the tips of their abdomens to wash off the eggs. Some of the forms fly quite early in spring but none of them are on the wing late in the fall.

The following will aid the student in separating our genera:

1. Hypertriagonal space free, sectors of the arculus free at origin...2
Hypertriagonal space traversed, sectors of the arculus more or less united at origin.....4
2. Hind wings with dark markings at least at base.....3
Hind wings without dark markings, colors metallic.
Somatochlora.
3. Hind wings, dark only at base with triangles free...*Tetragonuria*
Hind wings, dark at base, middle and apex, triangles traversed.
Epicordulia.
4. Large species, expanse over 90 millimeters, tenth segment of the abdomen black in both sexes.....*Macromia.*
Smaller species, expanse 70-75 millimeters, tenth segment light.
Didymops.

MACROMIA, Rambur.

The members of this genus are easily recognisable on the wing by the transverse yellow band of the abdomen. They are large species and fly from middle to late summer. Both males and females, in apparently

equal numbers, have been taken while flying over the surface of the water.

The following key will separate the species of the genus:

Expanse less than 100 millimeters, no antehumeral stripe
illinoisensis
Expanse 110 millimeters or over, antehumeral stripe present
taeniolata

Macromia taeniolata, Rambur.

Length of abdomen ♂ 58 ♀ 61, hind wing ♂ 52 ♀ 58.

Colors black, yellow and brown. Male; head large, front vertex black with two prominences above, frons metallic green with yellow spots superiorly, rhinarium fuscous; labrum olive, dark at middle and inferior edge. A faceted tubercle on the posterior edge of eye. Thorax fuscous with a distinct greenish reflection; yellow superiorly, part of antehumeral and a complete lateral band present, yellow. The latter entirely encircles the thorax, passing between the insertions of the two pairs of wings above and the second and third pairs of limbs below. Legs and feet black, the hind femora reaching the middle of the 2nd abdominal segment. Abdomen black, with superior yellow markings on segments 1-8. Superior appendages 3-5 millimeters in length, bent inwards at apical third, apex turned outwards; an emargination on the outer side extends from the base to beyond the middle where it terminates in a small tooth. Inferior appendage nearly as long as the superiors, conical, curving upwards towards the apex.

Female usually larger than the male, and in my specimens the superior yellow markings on 8 of the male are not present.

Female usually larger than the male, and in my specimens, the superior yellow markings on 8 of the

male are not present. The species is common in the north western part of the state along the Maumee River. The males fly well out, and consequently are seldom taken, the females oviposit among leaves and algæ near the shore.

Macromia illinoisensis, Walsh.

Length: of abdomen ♂ 48-50, ♀ 50; hind wing, ♂ 45 ♀ 46.

Male; colors fuscous, brown and yellow. Head very much as in *tæniolata*. Thorax brown or fuscous with metallic greenish reflections. Yellow before the base of the anterior wings, and lateral band present as in the latter species, but the antehumeral absent.

Wing hyaline often brownish tinted, more prominently at the apex. Superior yellow markings, often very small, on abdominal segments 2, 3, 4, 7 and 8, occupying nearly a third of 7 at base. This last is strikingly prominent when the species is on the wing. Superior appendages much as in *tæniolata*, but more gradually narrowed towards the apex; slightly longer than 10. Inferior appendage about as long as the superiors, conical, apex elevated. Female differs in having superior yellow markings on segments 2-7 and the wings are often more uniformly brownish.

The species flies most commonly during July, and may be seen at times some distance from water. I have taken the female flying over ripples of our larger streams, and a pair in copulation resting on a low bush not over two feet from the ground. It is more common than the preceding species and may be expected in any part of the state.

Its smaller size will separate it from *tæniolata*.

DIDYMOPS, Rambur.

The single species of this genus is commonly taken in Ohio. We have found it most common in May,

although it has been taken as early as April 25. At this early date the species was found in sunny places along the border of woods.

Didymops transversa, Say.

Length: of abdomen ♂ 36-38 ♀ 40; hind wing ♂ 33-35 ♀ 37.

Male; colors brown and yellowish. Head, front livid with frons and nasus brownish, frons above with an olive spot each side; rear of eyes yellowish, dark near the occiput. Thorax brown, a transverse band before base of the fore wings. mid-dorsal carina, a narrow humeral and a prominent lateral stripe, white; wings brownish at base, costa yellow, pterostigma and veins fuscous; legs, femora brown, tibiæ yellowish above, fuscous below, tarsi black. Abdomen brown, all the segments more or less banded, a prominent whitish band at base of 7, and a spot each side at base of 8; 10 wholly whitish or yellowish.

Superior appendages 2 millimeters in length, widest at base, nearly straight, posterior third on the outer side narrowed, apex acute; inferior appendage about as long as superiors, edged with brown, conical, apex blunt and furnished superiorly with a pair of prominences.

Female larger than the male and the brown markings between costa and third vein at the base of the wings is noticeably longer.

EPICORDULIA Selys.

The two species of this genus are American. We have only one of these in Ohio. This one is common along all of our larger streams, canals, and lake shores during July and August.

Epicordulia princeps, Hagen.

Length: of abdomen ♂ 43 ♀ 47; hind wing ♂ 41 ♀ 45.

Colors; olive, brown and fuscous. Male; front olive, vertex brownish, antennæ black. Thorax thickly clothed with long, gray pile, ground color olive, anterior, lateral band prominent below, humeral and antehumeral bands present, but usually very nearly obscure. Legs, coxæ and trochanters olive, front and middle femora olive above, fuscous beneath, hind femora and all the tibiæ and tarsi fuscous. Wings with a basal patch, often greatly reduced on the front pair, a patch at nodus, sometimes wanting, and apex black. Abdomen constricted at 3, largely fuscous above; beneath and on the sides yellowish brown. Superior appendages club shaped in general outline; inferior, apical fourth excised, apex very bluntly pointed. Inferior appendage more than two thirds the length of the superiors, widest at base, gradually narrowing to apex, which is furnished with two upward directed projections.

Female similar to the male in color and form, vulvar lamina nearly as long as 9, divided for its entire length, the two parts divaricate, slightly curved inward at apex; appendages longer than 9+10.

The species is easily identified by the black markings on the wings, as none of our large forms except some of the Libellulas have such characters.

TETRAGONEURIA, Hagen.

Two species of this genus have been recorded for Ohio. These fly in the fore part of summer, and one is very common. Small ponds seem to attract these forms, but it is not unusual to find them flying over running water. They are the smallest species of the sub-family, *Cordulinæ*.

Tetragoneuria cynosura, Say.

Length: of abdomen ♂ 30, ♀ 27; hind wing ♂ 28, ♀ 29.

Male; frons, labrum and labium yellow, other parts of front olive. In some specimens the whole front is olive. Thorax with a covering of long pubescence, two angular, yellow spots in front of the inferior half of the second lateral suture, these spots and both sutures margined with metallic blue. Basal two thirds of front femora yellowish or light brown, remainder of legs dark brown to nearly black. Fore wings hyaline; hind wings with a basal streak between subcostal and median veins extending to first antecubital, the space at extreme base between submedian and post-costal veins and a triangular patch occupying the lower part of the anal triangle and part of at least three neighboring cells, fuscous; remainder hyaline.

The dark markings of the wings are variable, but in none of our specimens do they extend much beyond what I have indicated, they may be very much reduced however. Abdomen fuscous with yellow markings on the sides of segments 2-9. Superior appendages as long as 9+10, the apical two thirds (nearly) thickened. From above separated at base, gradually approaching one another for one half their length, then diverging to apex. Inferior appendage reaching the middle of the thickened portion of the superiors, oblong conical, expanded laterally at extreme apex.

Female vulvar lamina composed of two horn-like lobes whose apices reach beyond the extent of the ninth segment.

The species is a common one in all parts of Ohio.

Tetragoneuria semiaqua, Burm.

Length: of abdomen ♂ 26-27, ♀ 28; hind wing ♂ 25-28, ♀ 29.

This species is very close to *cynosura*. Color alone is used to characterize it. The fuscous at the base of the hind wing is much extended, and occupies nearly all the space between the base of this wing and a line

drawn from the anal angle to the fourth antecubital. Different specimens vary in this respect, in some the dark marking is slightly reduced while in others it is extended. This character is constant in Maine specimens, kindly loaned me by C. C. Adams, in New York specimens and in Indiana specimens, so that, in none I have seen is there necessity of confusion with *cynosura*.

Taken at Columbus and observed at Delaware, in May.

SEVENTH SUB-FAMILY.

LIBELLULINÆ.

Twenty-eight species of Ohio dragonflies fall under this sub-family. They are second to the AGRIONINÆ when number of species is considered, but are by far the most conspicuous forms of our odonat fauna in all situations, especially during the summer season. Stagnant pools and ponds, skirted by sedges, cat tails and water lilies are especially attractive to them. Here the males fly back and forth, catching small insects for food, and searching for the females. While pursuing this apparent pleasure many of them sacrifice their lives to satisfy the greedy appetite of the king bird who perches himself on a branch of a nearby tree where he can view the proceedings and swoop down whenever he is sure he can procure a dragonfly for his trouble. Presently at your feet you observe the female with wings almost motionless, waving up and down, and at each downward movement, striking the tip of her abdomen on the surface of the water. She is ovipositing. If with a water net a quantity of the debris near the bank be procured a dozen or more nymphs of various stages are usually included. Thus one might seat himself and write out nearly a full life history of a dragonfly from the material of a few minute's collecting.

The members of this sub-family are medium sized to large species with ample wings and short, thick bodies. In some species males and females are colored differently, while in others both sexes are alike. Most of the forms are easily collected on account of their abundance, but there are a few species that occur over large areas and are never common anywhere, these are usually procured with difficulty. The Ohio species are placed in ten genera which may be separated by the following table:

1. Hind wings very wide at base, fore wings, except in some cases at extreme base, entirely transparent.....3
2. Hind wings not extremely wide at base.....4
3. Base of hind wing black or brown for its entire width.....*Tramea*
Base of hind wing transparent with anal margin yellowish, or infuscated at anal angle.....*Pantala*.
4. Hind lobe of the prothorax large, bilobed.....5
Hind lobe of the prothorax small, entire.....10
5. Sectors of the arculus pedicellate.....6
Sectors of the arculus not pedicellate.....9
6. Both sectors of the triangle in the hind wings arising from its hind angle.....7
Lower sectors of the triangle in the hind wings arising from its hind angle, the upper from its outer side.....8
7. Nearly black species, extreme base of hind wings black, front white.....*Leucorhinia*.
Never black, extreme base, sometimes basal half, of hind wings yellowish brown, front variously colored but never pure white, *Diplax*.
8. Base of hind wings perfectly transparent, thorax unicolorous, last antecubital of front wings usually not continued to median vein.....*Mesothemis*.
Base of hind wings yellowish brown, thorax banded with black and olive, last antecubital of front wings usually continued to median vein.....*Pachydiplax*.
9. Small species, expanse about 30 millimeters, hamule of male not bifid.....*Perithemis*.
Larger species, hamule of male bifid.....*Celithemis*.
10. Male with a pair of ventral hooks on first abdominal segment, third tibiae, as long as third femora.....*Plathemis*.
Male with no ventral hooks, female with third tibiae at least a little longer than third femora.....*Libellula*.

PANTALA, Hagen.

The two species of this genus are large with hind wings very wide at base. Abdominal segments 3 and 4 each with two additional transverse carinæ, nodal sector waved.

1. Front yellow, anal margin of hind wing yellowish.....*flavescens*.
2. Front red, anal angle of hind wing with a fuscous spot.
hymenæa.

Pantala flavescens, Fab.

Length: of abdomen ♂ 32-34, ♀ 34; hind wing ♂ 40-42, ♀ 41.

Male; color yellowish brown. Front yellowish, margins of mouth, antennæ and basal part of vertex fuscous.

Thorax, mid-dorsal carina and vestiges of lateral bands present, fuscous; hind wing, anal margin and a small patch at apex flavescens. Abdomen with a maculate mid-dorsal band, sometimes absent on some of the segments. Superior appendages about 3 m.m. in length, yellow at base, remainder black, oblong, nearly contiguous, and furnished with an oblique spine at apex. Inferior appendage two thirds as long as superiors. Female like the male.

The species is a strong flyer and fully matured specimens are hard to take as they fly well out from the bank. Taken in all parts of Ohio during July and August.

Pantala hymenæa, Say.

Length: of abdomen ♂ 30-33, ♀ 31; hind wing ♂ 40-42, ♂ 42.

Male, color reddish brown. Front red, margin of mouth, antennæ and basal part of vertex fuscous. Rear of eyes narrowly yellowish on the sides, remainder brown. Hind wing with anal angle and oftentimes apex fuscous. Abdomen reddish brown, segments 8-10 with black dorsal band. Female similar to the

male. Easily separated from *flavescens* by the red base, and fuscous spot at anal angle of hind wing.

The species has been taken at Columbus (Osburn), Laramie Reservoir (Williamson), and Columbus, in July.

TRAMEA, Hagen.

This genus contains three Ohio species. The base of hind wing in all of them is wide and conspicuously colored. Abdominal segments 3 and 4 with one additional transverse carina, nodal sector not waved or broken.

1. Basal fourth or fifth of hind wings violet black.....*lacerata*.
Basal part of hind wings brown.....2.
2. Basal third of hind wings brown, hamule not exceeding the genital lobe in length, vulvar lamina shorter than 9.....*carolina*.
Basal fourth of hind wing brown, hamule exceeding the genital lobe, vulvar lamina as long as 9,.....*onusta*.

Tramea lacerata, Hagen.

Length: of abdomen ♂ 37, ♀ 35; hind wing ♂ 42-45, ♀ 46.

Male, color brownish black. Front blackish, vertex and large part of frons metallic violet. Thorax with a greenish reflection, legs black, anterior wings hyaline, black at extreme base, hind wings violet black at base, the outer edge ragged, a triangular, hyaline space near the middle of the anal margin. A large light colored spot on the dorsum of the seventh abdominal segment, often obscure in dry specimens. Superior appendages as long as one half of 8+9+10, hamule shorter than the genital lobe.

The female has yellowish white markings on 3-7; on 3-5 these consist of a pair of small spots. Vulvar lamina one half as long as 9.

The species is common in all parts of the state during a large part of the summer.

Tramea carolina, Linn.

Length: of abdomen ♂ ♀ 32; hind wing ♂ ♀ 41.

Male, color reddish brown. Superior part of frons violet. Femora brownish at base, black at apex, tibiae and tarsi black; front wings hyaline, extreme base yellowish, hind wings reddish brown at base for nearly a third of their length, within the space many of the fine veins are yellowish. Abdominal segments 8-10 black above. Superior appendages a little longer than 9+10, slender and pointed at apex. Inferior appendage nearly two thirds as long as the Superiors. Hamules as long as, or very slightly longer than the genital lobes. Female abdominal segments 8 and 9 black, vulvar lamina not quite as long as 9, bilobed.

A comparatively common species in various parts of the state during the summer months.

Tramea onusta, Hagen.

Length: of abdomen ♂ 31, ♀ 33; hind wing ♂ 38-41 ♀ 42.

Male, color reddish brown, vertex brown, front reddish brown, in the specimens before me not showing the violet present on the superior part of the frons in *carolina*. Femora brownish at base, black at apex, tibiae and tarsi black; wings, anterior pair hyaline, extreme base brown, the reddish brown patch at the base of the posterior pair is narrower than in *carolina* and the outer edge is more ragged. Superior appendages a little longer than 9+10, hamules noticeably longer than the genital lobes.

Female vulvar lamina as long as 9, bilobed in its apical three fourths.

Taken at Columbus May 7, and at Cincinnati (Dury) May 23.

LIBELLULA, Linn.

In *Libellula* the posterior lobe of the prothorax is small and entire. The male is without hooks on the

first abdominal segment. Nine Ohio species are considered under this genus. Several of them are very common forms, while others are local or rare. None of them fly very early in Spring.

The following key will aid in separating the species:

1. Base of wings black nearly to middle for entire width.....*basalis*.
Base of wings transparent for at least a part of the width.....2
2. A dark colored patch of more or less extent at nodus of each wing.....3.
No dark patch at nodus.....6.
3. Dark marking at nodus entirely posterior to it, small.....4.
Dark marking at nodus surrounding it, much larger.....5.
4. Base of hind wing with a triangular, black patch which is produced at its outer angle, apex of wings transparent
quadrimaculata.
Base of hind wing with only the space between second and third veins, black, apex of wings fuscous, more prominently in the female.....*vibrans*.
5. Dark markings at base occupying nearly the anterior half of basal third of wing.....*pulchella*.
Dark markings at base small, situated near the middle of basal part of wing.....*semifasciata*.
6. Pterostigma prominently bicolored, yellow and black.....*cyanea*.
Pterostigma not bicolored.....7.
7. Wings with dark markings at base.....*exusta*.
Wings with no dark markings at base.....8.
8. Yellowish species, pterostigma yellowish with the veins above and below it black, costal third of wing membrane yellowish.
auripennis.
Dark species, pterostigma black, wings transparent except at apex in the female where they are fuscous.....*incesta*.

Libellula basalis, Say.

Length: of abdomen ♂ 29-31, ♀ 26; hind wing ♂ 41, ♀ 38.

Male, color blackish brown. Front yellowish to dark brown with a bluish tinge in fully matured specimens. Thorax with a mid-dorsal stripe yellow and a humeral and one lateral stripe dark in specimens not fully colored, in old specimens these markings are more or less obscured and the whole thorax is uniform blackish brown. Abdomen with a yellowish stripe each side which also is more or less obscured in old specimens.

Legs black, wings black on basal half to third, beyond this white, apical third clearly transparent.

The female usually lacks the white on the wings and the black at base is shorter and often reduced, especially on the fore wings, so that it has a smoky appearance. Apex of the wings often fuscous.

The species is very common and is usually the first species to attract the attention of the amateur collector. Like the other species of the genus, it prefers the vicinity of stagnant ponds where the sun's rays are unobstructed.

Libellula auripennis, Burmeister.

Length: of abdomen ♂ 36, ♀ 34; hind wing ♂ 38, ♀ 39.

Male, colors yellowish to brownish. Front in fully matured specimens shining brown, variable according to the stage of coloration of the specimen. In teneral specimens the mid-dorsal thoracic stripe is present, later this is obscured. The dorsal black stripe on the abdomen is apparently constant. Wings with a yellowish tinge, more prominent along the front margin, pterostigma yellowish, bounded by black veins.

The female is similar to the male, but has the apex of the wings smoky.

This species is quite distinct from other Ohio forms, but appears to be very close to *plumbea* of the eastern states. It may be separated from that species however by the absence of a brown, basal streak between subcostal and median veins.

Hagen reported this species from Ohio, but it has not been taken in recent years, until the past summer when specimens were procured at Cincinnati. It is probably a coast species by preference.

Libellula cyanea, Fabricius.

Length: of abdomen ♂ 30, ♀ 27; hind wing ♂ 35, ♀ 35.

Male, colors yellow and brown, wholly blue pruinose in old specimens. Front, mid-dorsal stripe and lateral spots on thorax, and abdomen each side, yellowish. In old specimens these markings are all obscured. Wings yellowish along the front margin, at base the space between subcostal and median veins black. Pterostigma bicolored, inner half sulphur yellow, outer half black.

The female has the wings decidedly black at apex, and in old specimens the yellow is encroached upon by brown.

The species so far has been taken in only one locality in the state. Here it has been observed two years in succession and no less than a dozen specimens taken, so we have no doubt that it is a permanent resident in Ohio.

Mr. J. B. Parker secured specimens at Danville in June 1897 and '98.

Libellula vibrans, Fabricius.

Length: of abdomen ♂ 40, ♀ 38; hind wing ♂ 46, ♀ 48.

Male, colors brown and yellowish, old specimens pruinose. Front olive, labrum and labium yellow, the latter black at middle, margins of mouth and mandibles black. Thorax yellow on the sides marked with black below, prothorax more or less black. Mid-dorsal stripe on thorax yellow. All these markings may become obsolete in old specimens. Abdomen yellow on the sides at first, but later no markings can be seen. Wings transparent, space between subcostal and median veins at base, a small spot at nodus, and extreme apex black.

The female has more black at apex of wings. This is the largest species of the genus in our fauna, the small nodal spots in connection with the basal space

between subcostal and median veins will characterize the species.

It is not a common form, but has been taken at Licking Reservoir and at Columbus (R. C. Osburn) in June.

Libellula incesta, Hagen.

Length: of abdomen ♂ 35-36, ♀ 32-33; hind wing ♂ 39, ♀ 40.

Male, yellowish to blue pruinose according to age. Teneral specimens have the front, sides of thorax and abdomen yellowish. Fully matured specimens have the front dark, nasus metallic superiorly, thorax and abdomen uniform blue, pruinose. No nodal patch or basal coloration, but some specimens have the nodus very narrowly margined with fuscous on each side.

The female retains more or less of the yellowish on front, thorax and abdomen throughout life. Her wings are like those of the male except they are fuscous at apex.

The clear transparent wings without nodal or basal spots will serve to separate this species from all others.

This seems to be a widely distributed species in the state, and in places is abundant. At Sandusky it is on the wing in June and July.

Libellula exusta, Say.

Length: of abdomen ♂ 25, ♀ 23; hind wing ♂ 33, ♀ 31.

Mature male, front olive, labrum and labium yellowish, occiput black, front of thorax and abdomen pruinose, sides of thorax brownish, humerus darker. Fore wings with two, short, basal streaks fuscous extreme base brownish. Hind wings at base with space between subcosta and median vein, and a triangular spot behind submedian vein fuscous, membranule

white. The thorax and abdomen of teneral specimens are lighter colored and not pruinose.

Female similar to the male.

This is the smallest species of the genus, taken in the state.

Four males taken at Stewart's Lake in Portage County, June 21, 1898. Not reported from any other section.

Libellula quadrimaculata, Linn.

Length: of abdomen ♂ 30, ♀ 30; hind wing ♂ 35, ♀ 36.

Male, colors olive, fuscous and yellow. Frons above black, in front yellowish, nasus and rhinarium olive, labrum yellow in the middle, edges black, labium yellow on the side, black between; rear of eyes black with two yellow spots. Thorax with narrow humeral and side stripes black, and two prominent spots yellow, prothorax and legs black. Front wings yellowish at base, nodal spot small, fuscous, hind wings with a basal, fuscous patch below the submedian vein; superior to this yellowish, nodal spot as in the fore wings. Abdomen yellowish or olive with black on venter and dorsum of 7-10.

The female has a conspicuous row of yellow dashes on each side of the abdomen from segment 3 to 9.

This species has been taken in the central and northern parts of the state but seems to be rare. It is on the wing in June.

Libellula semifasciata, Burmeister.

Length: of abdomen ♂ 26-28, ♀ 25-27; hind wings ♂ 35-37, ♀ 36-38.

Male, colors yellowish and fuscous; front yellowish, largely replaced by red. Rear of eyes brown with yellowish outer margin. Thorax brownish yellow with two lighter colored lateral bands; femora at base

yellowish, remainder of legs and feet fuscous. Fore wings yellowish on basal third, space between bases of sectors of arculus and a space below this between submedian vein and postcosta fuscous, a patch surrounding nodus, and apex brown; hind wings like the fore wings except the fuscous below the submedian vein is wider and extends to base and usually in addition a brownish patch near middle of the anal margin. Abdomen yellowish with fuscous, dorsal band present on 6-10.

Female like the male except the extreme apex of wing is hyaline. I have seen some males also with this character apparent.

A common form in all sections of the state.

Libellula pulchella, Drury.

Length: of abdomen ♂ 33-35, ♀ 32; hind wings ♂ 40-44, ♀ 42.

Male, colors brown, yellowish and fuscous. Front brownish, two yellowish spots behind the eyes. Thorax with two yellowish, lateral bands. Wings, a patch at base, a patch surrounding nodus, and apex fuscous. The basal patch is one fourth or more of the length of the wings and gradually widened distally but at no point touches either costa or posterior margin. Dark markings of hind wings like those of fore wings. Anal margin of hind wings and patches alternating with dark markings on all the wings whitish especially in old specimens. Abdomen with a yellowish longitudinal band each side.

Female similar to the male, but whitish on the wings may be absent. Old specimens of both sexes are pruinose.

A common form everywhere during a large part of the summer and autumn.

PLATHEMIS, Hagen.

The single Ohio species of this genus has the appearance of a *Libellula*, but the pair of hooks on the under side of the first abdominal segment of the male characterizes that sex. The female is much like *L. pulchella*, but its much smaller size will separate it from that species.

Plathemis trimaculata, De Geer.

Length: of abdomen ♂ 28, ♀ 24; hind wing ♂ 32, ♀ 35.

Male, colors brown and yellowish. Front brown, labrum and labium yellowish, rear of eyes brown with two bright yellow spots on each side. Thorax each side with two oblique, white stripes each terminating below with a yellow spot. A row of oblique yellowish spots on each side of the abdomen from 2-9. Wings, at base with a brown patch which in width extends from above the subcosta to the postcosta and in length about one fourth the extent of the wing, at middle with a brown patch covering the whole width, and in length reaching from before the nodus to about the middle of the pterostigma, apex from thence hyaline.

The female has the basal patch brown as in the male, a large nodal patch not reaching the posterior margin, and the apex of the wing from the middle of the pterostigma, brown.

The species is common everywhere, and may be seen resting on logs and fences along the edges of woods, as well as flying over stagnant ponds and running streams.

CELITHEMIS, Hagen.

The members of this genus are all graceful and active species. The wings are ample and variously marked, even in the same species. As they fly along the margins of ponds and lakes they are very attractive

to the collector who at once is filled with a desire to procure specimens, but he may experience many disappointments before his prize is captured. They spend much of the time perched upon the tips of sticks and reeds near the waters edge. The female of some of the species remain in concealed places a great deal of the time and consequently are seldom taken, while with others this sex is taken as frequently as the male. The female is attended by the male a great deal of the time while ovipositing.

Our three species may be separated as follows :

1. Expanse not less than 65 m. m., wings uniform yellowish with brown markings, apex of wings beyond pterostigma with no apparent brown or fuscous markings.....*eponina*.
Expanse not more than 60 m.m. wings hyaline with brown, yellowish or fuscous markings, apex of wings beyond pterostigma marked with brown or fuscous.....2.
2. Wings with brown and yellowish markings, pterostigma reddish
elisa.
Wings with fuscous or black markings, pterostigma black
fasciata.

Celethemis eponina, Drury.

Length : of abdomen ♂ 25-27, ♀ 23-25; hind wing ♂ 31-33, ♀ 30-32.

Male; colors brown and yellowish. Front brownish, thorax with two, narrow, black, lateral bands, abdomen with dorsal and lateral bands present, yellow. Fore wings yellowish with a spot between arculus and outer side of triangle, a band at nodus not attaining the posterior margin and a band before the pterostigma usually reaching the posterior margin, brown. Hind wings yellowish with a patch attaining the base and extending to distal part of triangle, a spot near anal angle, a divided nodal band and band before pterostigma, brown. Any of these markings may be reduced.

The front of the female is usually yellow, and the ground color of the wings is lighter than in the male.

The markings of the wings are like those in the male but may be very much reduced, but not entirely absent.

An exceedingly abundant species in all sections. In the marshes around Sandusky Bay it is more common perhaps than any other dragonfly during July. Pairs in copulation were taken July 18, 1896.

Celethemis elisa, Hagen.

Length: of abdomen ♂ 20-22, ♀ 19-20; hind wing ♂ 27, ♀ 25.

Colors: male, red, black and yellowish, front red; fore wings hyaline, base yellowish a point above the triangle, a spot beyond the nodus, and apex reddish brown; most of the cross veins along the costal margin, margined with brown, pterostigma yellowish to red.

Hind wings hyaline, with an elongated, irregular patch extending from base of wing to beyond the outer part of the triangle, a large patch below this not quite reaching the posterior or anal margin, a patch beyond nodus, and apex, reddish brown; the basal fourth of the wing where not occupied by brown is yellowish, pterostigma and cross veins as in the fore wings. Abdomen black, superior parts of 3-7, except apex, red.

In the female the front is yellowish, the color at the base of the hind wings is clearer than in the other sex, and abdominal segments 2-7 are yellow superiorly; otherwise like the male.

The form is very common in northern Ohio and has been taken in the southern part of the state. Differing from the preceding species, the females are taken much less commonly than the males.

Celithemis fasciata, Kirby.

Length: of abdomen ♂ 23, ♀ 21; hind wing ♂ 27-28, ♀ 27.

Male, colors black and yellow. Front; frons metallic blue, nasus, rhinarium and labrum yellow in

some specimens, black in others; labium yellow at the sides, black at middle, in one specimen the yellow parts are olive to brown. There is so much variation in these parts, that definite statements regarding them can not be formulated. Thorax in one specimen yellowish on the sides with two black bands; in another the yellowish is entirely absent. Fore wings hyaline, fuscous or black as follows: apex from distal part of pterostigma; a patch beginning at costa, nearer the pterostigma than the nodus and extending backwards half way across the wing; this patch is narrowed or nearly divided near its middle, making it somewhat hour-glass form; and a patch beginning at nodus below the subcosta and extending towards the base of the wing; at some point between nodus and triangle this patch is divided, sending a superior branch to base between subcostal and median veins, and an inferior branch to beyond the inner side of the triangle between the sectors of the arculus; a small patch including the superior part of the triangle connects with the inferior branch and sends a spur towards the base of the wing between submedian and postcostal veins. This spur and the superior branch mentioned above may or may not be interrupted by clear spaces. In the hind wings the apex and patch before the pterostigma are as in the fore wings, except the latter may be entirely divided. Distally the basal patch may be bounded below by the lower sector of the arculus or it may send back a process which in extreme cases reaches the lower sector of the triangle; the basal patch, also includes the entire triangle and a basal process which extends backwards and terminates on a level with the distal end of the membranule; included within the basal patch is a hyaline patch which occupies the space between median and submedian veins to arculus, and the space between median vein and superior sector of the arculus to a point above the

outer part of the triangle. In addition the hind wings have a nearly round spot before the anal angle. The abdomen is uniform black in all specimens before me, but I should suppose that in teneral specimens it might be otherwise.

The female has the extreme apex of all of the wings hyaline. The extremity of the distal process of the basal patch in the hind wings is separated from the main part in one specimen and exists as a separate spot. The spot before the anal angle is reduced in all my specimens, and in one specimen is very small. The front is yellowish and the abdomen has a dorsal band in the form of triangular spots on segments 2-8; various yellow markings are present on the sides of the abdomen in a teneral specimen but are absent in a mature specimen.

The species seem to prefer small lakes where the water is clear. Six specimens were taken in Summit County along the shores of Silver and Summit Lakes in June and July. June 23 was the earliest date that specimens were taken, at this time the females were teneral, but the males had full colors. Their actions in the field are like those *C. elisa*.

LEUCORHINIA, Brittinger.

This genus contains only one Ohio species.

The pterostigma is short and broad, not more than twice as long as broad, the wings are yellowish and black at base. The species is a common one and like other members of its family is attracted to strgmant ponds.

Leucorhinia intacta, Hagen.

Length: of abdomen ♂ 23, ♀ 21; hind wing ♂ 24-26, ♀ 25.

Male, front white, labrum yellowish, labium black, brownish on the sides; rear of eyes black, feet and

legs black. Front wings black at extreme base, this color may extend outward a short distance between subcostal and median veins, and submedian and post-costal veins, thus forming two basal streaks. Hind wings black at base, here the color takes the form of a basal black streak and a basal triangle beneath. The abdomen is black with a superior yellow spot on the base of 7. In young specimens a dorsal spot is present on each of segments 2-7.

The female usually has more or less yellowish on the basal third of the wings, and the abdomen is stouter and marked with yellow on the sides as well as on the dorsum.

A common species.

DIPLAX, Charpentier.

Six Ohio species are included within this genus. Most of them are seldom seen flying over water but may be found in profusion in the adjoining marshes or lowlands. Males and females inhabit the same spot, and are each taken in nearly equal numbers. They are characterised while on the wing by their striking red bodies, which become dull brown in dry specimens. This red color is not apparent, however when the insect first emerges, and only comes gradually with increasing age. Old and worn specimens have lost the bright red and appear duller in coloration. One or more species may be found on the wing at any time between June 10, and the middle of October.

I offer the following Key which is largely taken from Calvert's work on the genus, as an aid in separating our species:

1. Basal half of hind wings yellowish.....5
Hind wings with extreme base, or not at all, yellowish.....2
2. Expanse over 60 millimeters, an additional carina on abdominal segment 4.....*corrupta*.
Expanse less than 60 millimeters, no additional carina on 4.....3

3. Male inferior appendage four fifths as long as the superiors; superiors with no prominent inferior tooth, but with 4-9 inferior denticles of which the distal one is the largest; female vulvar lamina entire.....*vicina*.
Male inferior appendage about two thirds as long as the superiors; superiors with a prominent, inferior, median tooth on the basal side of which are 5-8 denticles; female vulvar lamina bifid.....4
4. Male genital hamule with a little more than its apical third bifid, posterior branch twice as wide as the anterior, front usually pinkish in fully developed specimens.....*rubicundula*.
Genital hamule with apical fourth bifid, posterior branch at least four times wider than internal branch. Front usually whitish olive in fully developed specimens.....*obtrusa*.
5. Male superior appendages with a prominent, inferior, median tooth; female vulvar lamina bifid at apex.....*assimilata*.
Male superior appendages with no prominent inferior tooth, but with 4-9 inferior denticles of which the distal one is the largest; female vulvar lamina entire.....*semicineta*.

Diplax rubicundula, Say.

Length: of abdomen ♂ 22-26, ♀ 22-24; hind wing ♂ 25-29, ♀ 26-28.

Male; front yellowish to reddish, wings hyaline, extreme base of both pairs yellowish, femora brownish at base and on the inner side, remainder of legs and feet black. Abdominal segments 3-10 black on the sides, and brown beneath. Genital hamules bifid for a little more than a third of their length, the anterior lobe longest, a little curved, and acute and tipped with black at apex; the posterior lobe is nearly triangular in outline with the apex rounded. Superior appendages with a prominent, inferior tooth at middle, bearing on its proximal side about seven teeth. Inferior appendage reaching nearly two thirds the length of the superiors and bearing a hook-like tooth on each side above. From below the inferior appendage is nearly conical with apex broad and slightly prominent at the sides.

The female is similar to the male in color and size. The vulvar lamina is bifid at apex.

This species is abundant from the middle of June to the first of October.

Diplax assimilata, Uhler.

Length: of abdomen ♂ 24-25, ♀ 22-25; hind wing ♂ 26-29, ♀ 26-30.

This and the above species vary considerably in size, and one would expect to find specimens both larger and smaller than the measurements given.

D. assimilata has been placed as a synonym of *rubicundula* by Calvert, but by others it is considered a distinct species. After a careful study of the anatomy of both, I am unable to give any constant character for their separation except the yellowish coloring of the basal half of the wings in *assimilata*.

Toledo July 30, Sandusky July 20, not uncommon at Columbus.

Diplax obtrusa, Hagen.

Length of abdomen ♂ 22-25, ♀ 24; hind wing ♂ 22-25, ♀ 23-25.

This species resembles *rubicundula* so much that it seems best to give simply the points of difference between the two species.

Genital hamules of the male with apical fourth bifid, the branches of the same length; posterior branch at least four times as wide as the internal branch.

The female is separated from the female of *rubicundula* by the vulvar lamina. In the last named species this is short, rather broad and bifid at the tip. The two lobes have the appearance of being inflated, are strongly convex below, and straight above and terminate rather abruptly; while in *obtrusa* the hamule, although short, and bifid at the apex, is narrower, the two lobes have an angular appearance, are only slightly convex below, and each slopes rather gradually to an acute point at apex. Instead of appearing inflated, the two lobes rather appear contracted.

In both sexes the front is more nearly white than in *rubicundula*.

The species is common in all parts of the state. It begins to fly in July and is most abundant in August and the first part of September.

Diplax vicina, Hagen.

Length: of abdomen ♂ 21-23, ♀ 20-24; hind wing ♂ 24-25, ♀ 22-25.

Colors as in *rubicundula*, yellowish in teneral specimens, red in fully matured specimens. Male, front reddish. legs and feet brown or at least not black, wings hyaline, yellowish at extreme base.

Genital hamules small, bifid for more than half their length from apex, the two branches of nearly the same width at base. the anterior one longer, curved and acutely pointed at apex; the posterior one widest near the middle and irregularly rounded at apex. Superior appendages widest half way between middle and apex, before the widest point are about five inferior teeth. Inferior appendage nearly four fifths as long as the superiors.

Female, vulvar lamina widest behind, distinctly projecting, hind margin entire.

Taken in all sections of the state, and appears later in autumn than any other species of the genus. Taken in copulation Nov. 7, at Columbus.

Diplax semicineta, Say.

Length: of abdomen ♂ 18-21, ♀ 17-21; hind wing ♂ 21-25, ♀ 20-24.5.

Colors, yellowish in teneral specimens, red in fully matured specimens. Male, front reddish to yellowish. Legs at base and inferior side of front femora reddish, remaining parts blackish. Basal part of front wings, sometimes to triangle, sometimes to nodus yellowish; hind wings, basal half yellowish.

Genital hamules bifid for apical half, the anterior branch shorter pointed and slightly hooked at apex, posterior lobe three times as broad as the anterior, apex rounded. Superior appendages with about six inferior teeth beyond the middle. Inferior appendage four fifths as long as the superiors.

Female colored like the male or with yellowish part of fore wings brighter than in that sex. Vulvar lamina short, only slightly projecting, posterior margin entire.

Taken at Columbus. Common at Sandusky in July.

Diplax corrupta, Hagen.

Length: of abdomen ♂ 26-29, ♀ 27-28; hind wing ♂ 28-30, ♀ 29-31.

Male, teneral, yellowish; front yellowish, thorax with an antehumeral, a narrow humeral, and two lateral bands terminated below by a bright yellow spot, grayish. Abdomen yellowish, sides with the ventral margins of the segments black; dorsal spots on 8 and 9. Legs, at base, and superior side of femora and tibiae yellow, other parts black. Wings nyaline with veins and pterostigma yellowish.

The male when fully colored is red. The markings on the thorax are reduced to the two bright yellow points or spots on each side. The legs are like those of the teneral form. The venation of the wings is reddish. Genital hamules small, apical third bifid, anterior branch short, sickle form and acute at apex; posterior branch twice as long, several times as broad, directed obliquely outwards and backwards, rounded at apex. Superior appendages 2 m.m. in length, yellow, with a row of inferior, black denticles which begin near basal third and extend to where the appendage begins to narrow; apex tipped with an acute, black spine. Inferior appendage three fourths as long as the superiors.

Female colored like the male, except her front is lighter, usually yellowish. Vulvar lamina short, most prominent at the sides.

The large size of this species separates it from other Ohio members of the genus.

One should observe *corrupta* in the field for one season to become thoroughly acquainted with its variations. If he does not know it in all its stages to begin with, and if he is eager to obtain the greatest number of forms possible in a certain locality, he can easily convince himself that the various colorations it presents, represents at least three distinct species.

It is common in all parts of the state during July and August.

PERITHEMIS, Hagen.

In the single species of this genus, the hind wings are longer than the abdomen. Although very common around water, it is not conspicuous because of small size and rather secluded habits. It flies low and rests a part of the time on water plants or anything that projects above the water. While its colors are developing after emergence it may be found in the fields some distance from water. Males and females are taken usually in about equal numbers.

Perithemis domitia, Drury.

Length: of abdomen ♂ 14-15, ♀ 13-14; hind wing ♀ 19-20, ♂ 19-20.

Male, colors yellowish to brown, wings uniform yellowish or sometimes with a brownish point above the triangle. Thorax often with two olive, lateral bands or with each band represented by a small spot below the middle; these thoracic markings may be obscure or wanting. Abdomen nearly uniform brown in dry specimens.

Female, front wings with costal margin yellowish nearly to pterostigma, a patch at nodus extends

backwards almost to posterior margin, and a much smaller patch above the outer part of the triangle, brown; hind wings with costa and nodal patch as in the fore wings, but the other patch includes the triangle and is extended backwards nearly to the anal angle, and sends two branches to base, one between the subcostal and median veins and another between submedian and postcostal veins. These markings are subject to variation in extent and intensity of color.

Common in all parts of the state from June to September.

MESOTHEMIS, Hagen.

The single Ohio species of this genus is very common. The males are most often seen as they fly over open water a part of the time, the female usually remain among grass and weeds that grow either in or near the water; she is very attractive, but her green color protects her somewhat, and she may fly very near the collectors feet without being observed. She oviposits among low plants that grow in the water.

Mesothemis simplicicollis, Say.

Length: of abdomen ♂ 27-32, ♀ 29-31; hind wing ♂ 30-33, ♀ 32-34.

Male, colors black and green. Rear of eyes yellow marked with brown in such a manner that they appear chequered. Thorax green, legs black. Both thorax and abdomen blue pruinose in old males. Superior appendages, yellow, a row of black denticles extending nearly the whole length of inferior edge. Inferior appendage brown, four fifths as long as the superiors.

In the female the abdomen is green with distal part of 4-7 and all of 8 and 9 dark brown above. All the segments more or less dark brown below. Vulvar lamina triangular, margin entire.

Abundant throughout the state, from May to September.

PACHYDIPLAX, Brauer.

This genus is represented by a single species.

The frons above and vertex are metallic blue, which character will separate it from related forms. It flies over shallow water where lilies and other water plants grow, here the female oviposits. Teneral specimens may be found a long distance from water.

Pachydiplax longipennis, Burm.

Length: of abdomen ♂ 20.29, ♀ 18-24; hind wing ♂ 25-33, ♀ 25-31.

Teneral male, front, labrum and labium yellowish, margins of mouth brown, frons above and vertex metallic blue. Thorax with mid-dorsalcarina, an antehumeral stripe, abbreviated above, an irregular humeral stripe continued above by a transverse stripe before the antealar sinus, a wide, lateral stripe beneath the fore wings, one between the wings and all the posterior part of metathorax, yellow; otherwise brown. Legs; coxæ, trochanters and inner side of front tibiæ, yellowish; remainder including the feet dark brown. Wings yellowish at base, otherwise hyaline. Abdomen, venter and basal part at sides yellowish, dorsum brownish or blackish usually with a longitudinal row of yellow dashes on 2-8.

In the fully developed male the abdomen becomes pruinose and all the markings are obscured, the brown of the thorax becomes more or less greenish, and the hind wings have two longitudinal, dark brown, basal streaks, one between subcosta and median veins, the other between submedian and postcostal veins; both reach nearly to arculus. These latter may be present in teneral males.

The female is colored like the teneral male or pruinose in old specimens, her abdomen is widened posteriorly, her wings are yellowish at extreme base and the hind pair lack the longitudinal stripes.

Common in all parts of the state.

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